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KNOWLEDGE
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POWER *ESSAYS ON*
SCIENCE AND GOVERNMENT

EDITED BY *Sanford A. Lakoff*



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ACKNOWLEDGMENTS

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First Printing

THE ASSOCIATION of knowledge posed dramatically by history, has long been a part of our time it is not only a part that come to fruition in a complicated and unexpected edge does not always lead to confusion. Power is not knowledge; it may only project may yield no product considerably from the needs. Developments previous balances of power even ostensibly powerful technology a king may call upon to receive a clear and precise politicians to do in a definite advice and find that, like

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PREFACE

THE ASSOCIATION of knowledge and power—*scientia et potentia*—posed dramatically by Sir Francis Bacon at the dawn of modern history, has long been an idea fascinating to imaginative minds. In our time it is not only an idea but a reality. But like all bold ideas that come to fruition in social life, this one too takes far more complicated and unexpected forms in reality than in conception. Knowledge does not always provide power; it sometimes only breeds confusion. Power is not necessarily enhanced by the pursuit of knowledge; it may only be rendered obsolete. A large research project may yield no particularly useful results and yet subtract considerably from the resources available to meet pressing social needs. Developments in science and technology often upset previous balances of power and sometimes create problems that even ostensibly powerful nations are incapable of solving. In mythology a king may call upon his Merlin to solve such a problem and receive a clear and presumably scientific answer; but what are politicians to do in a democracy when they call upon scientists for advice and find that, like other mortals, these too disagree?

Contradictions such as these in the relationship of knowledge to power are so commonplace today that we almost ignore them. One day we watch tensely, with feelings of elation and relief, as our astronauts complete a successful mission in space. The next day we listen sympathetically as a congressman complains that we ought not to be spending five billion dollars a year to reach the moon while poverty and disease remain unrelieved on earth. One moment we learn with joy and admiration of some new triumph of medical science—an advance in preventative medicine, an artificial organ, a new surgical technique—which will prolong life; the next we are warned that the rise in population made possible by medical progress poses a grave threat to civilization. Wonder drugs are found to have miraculous effects in some respects and terrible side effects in others. Pesticides improve crop yields but soon threaten, by their very success, to impair the environment in other no less important respects. By withdrawing personnel and facilities from other uses, the very investments in science that confer immediate benefits in terms of international power and prestige weaken the process of innovation in the civilian sector of the economy upon which national

power depends in the long run. Nor are these the last of the paradoxes we and our progeny will have to confront in the effort to put to use the processes and results of scientific creativity. Future advances in genetics and climate control, for example, may pose dilemmas even more difficult than these, and the problem of allocating scarce resources is likely to grow still more pressing in the future.

All the while, in subtle but profound ways, the increasing involvement of society in the underwriting and direction of research and development raises general issues of public policy. When universities and industries come to depend upon government subvention, new relationships must be worked out if the autonomy of the private sector and the public interest are both to be protected. When scientific advice becomes a crucial component of vital decisions in foreign and domestic policy, the role of the adviser in the decision-making process must be clarified and defined if the adviser is to be free to give an independent judgment and if policy is to be decided by responsible representatives.

Political questions such as these demand study—and they are being studied with increasing depth and frequency. Only a few years ago, when a colleague and I decided to introduce a course on science and government, it was hard to find enough good material to assign. Now there are a number of such courses being taught throughout the country, and no single volume could possibly contain all the worthwhile studies that are now regularly produced in this general area. In this collection I have tried to assemble a number of those that seem to me and to others familiar with the literature to offer a solid and wide-ranging view of the field. The fifteen essays here presented are diverse in nature and in topic, as befits a subject with so many ramifications. I have reluctantly excluded many other valuable studies, on the grounds that they are readily available elsewhere or are too large and detailed to survive condensation. A substantial list of such studies is appended in the form of a Select Bibliography.

For assistance in the preparation of this volume, I am especially indebted to a number of colleagues. My friend and collaborator, J. Stefan Dupré, who would have been coeditor of this volume had not Canadian affairs monopolized even his prodigious energies, worked with me to initiate the project. W. Eric Gustafson also contributed to laying the groundwork. Don K. Price was helpful throughout as a ready source of sound advice. Carl Kaysen and Robert C. Wood also made helpful suggestions. Victor J. Stein of Varian Associates helped me to avoid unnecessary duplication in canvassing for contributions. Martin Kessler, Herbert Cohen, and Charles Christensen of The Free Press have been most helpful. William S. Comanor and Harvey M. Sapolsky kindly called my

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For the support of me indebted to various institutions was written for a graduate afterward awarded a Boy of the prize committee for late Perry Miller. The lectures in a course at H. Lecture given at Colby of 1963. The paper on "Pluralism" was originally series of lectures on science Paul J. Piccard at Florida. It has been further developed Science Foundation in New York. During the a in research and writing fellowship from the General administered under the Brown University. During views with government the Office of Science and with the federal government particularly to thank and acknowledge the assistance information with keen volume I have been assisted Elma Leavis, Joan Erdman Ashley L. Schiff. I acknowledge

I have taken an enormous essays to Don K. Price in to the understanding of ment. All students of thank gratitude.

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attention to significant acquisitions of the Science and Public Policy Library at the Littauer School, Harvard. My deepest gratitude must go, however, to the contributors to this volume.

For the support of my own research and writing, I am especially indebted to various institutions. The essay on the Oppenheimer case was written for a graduate seminar at Harvard in 1955 and was afterward awarded a Bowdoin Prize. I am indebted to the members of the prize committee for their encouragement, particularly to the late Perry Miller. The essay on the "third culture" derives from lectures in a course at Harvard and, in particular, from a Gabrielson Lecture given at Colby College in Waterville, Maine, in the spring of 1963. The paper on "The Scientific Establishment and American Pluralism" was originally delivered in November 1964, as one in a series of lectures on science and government initiated by Professor Paul J. Piccard at Florida State University in Tallahassee, Florida. It has been further developed with the aid of a subsidy from a National Science Foundation institutional grant to the State University of New York. During the academic year 1963-64, I was able to engage in research and writing in this general area thanks to a generous fellowship from the George and Eliza Gardner Howard Foundation, administered under the direction of Dean R. Bruce Lindsay of Brown University. During this period I benefited from many interviews with government administrators in the Bureau of the Budget, the Office of Science and Technology, and other agencies concerned with the federal government's programs in science. I should like particularly to thank William D. Carey and J. Lee Westrate. I acknowledge the assistance of these benefactors and sources of information with keen appreciation. In the preparation of this volume I have been assisted by my wife, Evelyn Lakoff, my typists, Elma Leavis, Joan Erdman, and Barbara Kornfield, and my colleague, Ashley L. Schiff. I acknowledge all this help with keen appreciation.

I have taken an editor's liberty to dedicate this collection of essays to Don K. Price in recognition of his preeminent contribution to the understanding of the modern relations of science and government. All students of these relations owe him a profound debt of gratitude.

Sanford A. Lakoff

STATE UNIVERSITY OF NEW YORK AT STONY BROOK

For Don K. Price

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SANFORD A. LAKO

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3. Mohole:
The Project That Went Wrong
DANIEL S. GREENE
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The Establishment of NASA

ENID CURTIS BOK SCHOETTLE

MOST AMERICANS engaged in the research and development activities concerned with outer space work under public auspices. Professionally they may be members of university staffs or employees of private industry, but their particular projects are almost always publicly authorized and publicly supported. Since October 1, 1958, the overall direction of the American space effort has been lodged in the National Aeronautics and Space Agency (NASA), an independent civilian agency within the executive branch of the federal government. That agency, directed by a single administrator responsible to the President, was provided in the fiscal year 1966 with 5.17 billion dollars for the formal legal purpose of seeking "the solution of problems of flight within and outside the earth's atmosphere and problems for the development, testing and operation for research purposes of aircraft, missiles, satellites and other space vehicles."

The object of this study is to explain why such organizational and financial arrangements exist. Why is the space program a public endeavor? Why is it directed by a civilian rather than a military agency? Why is that agency under a single executive? Why is it financially supported at such a scale and with relatively few congressional or budgetary constraints compared with other publicly supported enterprises?

In a broad sense these policy choices reflect a national response to the challenge of Sputnik. The launching of the first Soviet

ENID CURTIS BOK SCHOETTLE is currently Lecturer in Political Science at Swarthmore College. This study was done under the auspices of the Organization Research Project at MIT under NASA sponsorship. It is part of a doctoral dissertation on policy-making in the space program now in preparation under the direction of Professor Robert C. Wood of MIT, presently Under Secretary, Department of Housing and Urban Development.

THE ESTABLISHMENT of a satellite on October 4, 1957, passed that of the political leaders and adverse shifts in national resources. In the integrated national resource research and development combined private and national structures and management, to exhibit in the field.

Yet on closer factory. It fails, if It does not account to anticipate Sputniks of the public with great intensity does not explain and several possibilities. It establishes no established arrangements to take the lead in space.

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To achieve goals study selects and of how political politics. The success

satellite on October 4, 1957, represented a Russian achievement in particular scientific and engineering fields which dramatically surpassed that of the United States. The American public and American political leaders viewed this achievement as signaling a dangerous and adverse shift in the balance of military power between the two nations. In the interests of national security, they made a reallocation of national resources to redress the balance. Since previous space research and development activities had been carried out by combined private and military efforts and found wanting, new organizational structures were devised. These changes in resource allocation and management, it was expected, would enable the United States to exhibit in the near future technological superiority in the space field.

Yet on closer examination this broad explanation is not satisfactory. It fails, first, on the grounds of precision and specificity. It does not account for the initial failure of the nation—as a nation—to anticipate Sputnik I. It does not differentiate among those segments of the public and the political leadership which responded with great intensity and great concern and those which did not. It does not explain why, among several organizational alternatives and several possible levels of support, particular choices were made. It establishes no basis for estimating the probabilities that the newly established arrangements and programs would enable America to take the lead in space exploration.

Second, this explanation fails to illuminate the process by which the transformation of our space effort from a small, privately oriented one to a large, publicly oriented one took place. Its gross characterizations of public alarm and official response do not describe how our political system functions in resolving an issue of this magnitude; what considerations motivated influential persons and groups within the system; or what actions they took with what results to account for the successive decisions which in one year led to the establishment of NASA. Thus, it neither identifies the prime components of the system and their interaction nor makes clear what units of political influence are in fact responsible for the present particular pattern and scale of operations. Yet knowledge of these factors is essential if we are to distinguish between the consequences of public and private management of the space effort, account for the objectives and character of the present program, and arrive at some judgment of how it might be directed for more efficient achievement of certain goals in the future.

To achieve greater precision and more explanatory value, this study selects and organizes facts according to a contemporary model of how political influence is distributed and applied in national politics. The success of the Soviet launching is treated as generating

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a conflict (or issue) within the national political system. More accurately, the launching expanded the scope and intensity of a conflict which had been previously confined to relatively few activists within the system. After Sputnik, other activists with different motivations, political resources and intensities of interest, operating under different informational and structural constraints, became engaged in the issue. Although all the activists could be said to be motivated by common considerations of national security, their perception of these considerations, their place within the system, and the impact of the conflict upon their political resources established a second order of objectives which differentiated their preferences for possible solutions to the conflict.

In a new and larger structural context, the activists devised strategies by which they sought to have their preferences for successive policy choices prevail. To assure the success of their strategies, they sought to make coalitions with other activists by discovering identities of interest, by persuasion, by bargaining, or by the exercise of superior formal authority (coercion). Finally, the space agency emerged: a product of the combined strategies of the most influential and interested participants.

Obviously, an analysis which screens data by these criteria does not identify all the relevant forces which help account for the structure and magnitude of our space effort. Neither does it exhaustively characterize the properties of the forces which it chooses to emphasize. Highly relevant traits of personality, undocumented or undisclosed actions of major participants, and unconscious motivations probably escape detection. Rather than providing an exhaustive historical treatment, this study primarily attempts to identify the structure of political power and the functioning of the political system which together inaugurated—and indeed still largely sustain—the nation's greatest technological venture.

Space Before Sputnik

The technological success of Sputnik I surprised most American citizens, and the political reaction which followed caught many American political leaders unaware. Yet not every segment of the public nor every public official had failed to anticipate the Soviet accomplishment or its political repercussions. There was a United States space program in being prior to October 4, 1957. But it was an effort with which few citizens were familiar, with limited support by figures of national prominence, carried forward in the lower echelons of the national bureaucracy. Those who anticipated that the launching of an earth satellite would be a political event of first magnitude lacked the resources, motivations,

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or skills to arouse the nation or persuade its leaders to take action.

The origins of the American program were in the defense establishment. In 1946, the Department of the Navy recommended to the Joint Research and Development Board that a project to place a small satellite in orbit around the earth be initiated. The Committee on Guided Missiles of the board rejected the proposal as "not having sufficient military requirement."¹ There the matter rested until 1954, when a confluence of interests from within the DOD and a portion of the scientific community then engaged in planning the International Geophysical Year occurred. As to the first, in September of that year, Dr. Werner von Braun of the Army Ballistic Missile Agency published a classified paper, "The Minimum Satellite Vehicle Based upon Components Available from Missile Developments of the Army Ordnance Corps."² After discussions within the Ordnance Corps and with civilian scientists, von Braun made his first efforts to initiate the project. In December, a joint voluntary Group of the Army and Navy undertook design-planning and christened their effort Project Orbiter.

So far as the civilian scientists were concerned, their interest in a satellite project derived from America's forthcoming participation in the IGY. This "year," like its predecessors, the First Polar Year of 1882 and the Second Polar Year of 1932, was designed to accomplish a world-wide program of geophysical observations and research in a limited span of time. The IGY, lasting from July 1, 1957, to December 31, 1958, was sponsored by the International Council of Scientific Unions (ICSU), a nongovernmental organization of constituent national scientific academies, among them the American National Academy of Sciences, and the Soviet Academy of Science. In the fall of 1951, the ICSU decided to convene a special committee, consisting of representatives from thirteen general or technical scientific unions in the geophysical disciplines, to work on plans for a year of geophysical research. In early 1952, the ICSU Executive Bureau called upon individual nations to establish national committees for the IGY, which would plan and direct each country's research efforts. Finally, in October 1952 the ICSU constituted the Comité Spécial de l'Année Géophysique Internationale (CSAGI) to coordinate the programs of the IGY.

In response to the ICSU directive, the National Academy of Sciences, as the American affiliate, called on the government to authorize its participation in the IGY. At an early stage, the National Academy persuaded the government to do so. Sometime before the May 1954 deadline for the submission of detailed national research programs, the National Security Council (NSC) decided that the United States "should make a major effort during the IGY." The NSC requested the National Academy's National Research Council,

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established in 1916 to coordinate governmental and nongovernmental scientific efforts, to direct and plan the scientific research. This agreed, the Council established a special US National Committee for the IGY. The NSC also ordered the Department of Defense (DOD) "to furnish whatever support was necessary to place the scientists and their instruments in remote locations."³ Finally the NSC charged the National Science Foundation (NSF) with providing governmental support for the IGY and serving as the channel through which official funds were requested and administered. Thus, in October 1954, when the CSAGI decided to advocate earth satellite projects as part of the IGY program, the American IGY effort was already firmly tied to the major governmental scientific agencies of the NSF and DOD and, through the quasi-governmental National Academy, to the necessary pools of disciplinary expertise in the private scientific community.*

Although the IGY initiated the policy decision to go into space, the American space program originated much earlier in the scientific bureaus of the military services. And even within the military establishment, tension between the scientific and military missions of a space program characterized its history. In 1945 the Bureau of Aeronautics in the Navy established a Committee for Evaluating the Feasibility of Space Rocketry. In November of that year, the Committee recommended that high priority be given satellite development. In 1946 the Bureau, through the newly established Office of Naval Research (ONR), developed a satellite proposal. In 1947 the Air Force's Project Rand also found that earth satellites were technically feasible. In March 1948, the Technical Evaluation Group of the Committee on Guided Missiles of the Research and Development Board in the DOD reviewed these two proposals. It decided that neither the Navy nor the Air Force had "as yet established either a military or a scientific utility commensurate with the presently expected cost of a satellite vehicle. However, the question of utility [deserved] further study and examination." At the end of 1948, Secretary of Defense James Forrestal revealed that the earth satellite program, previously carried out independently by the services, was to be assigned to the Committee on Guided Missiles for coordination.⁴

The satellite program remained at this study stage within each service for several years. Then, in June 1954, a group of rocket specialists including Frederick C. Durant III, president of the

*On the two subcommittees of the US National Committee for the IGY most directly concerned with the space program—the Rocketry Technical Panel and the Earth Satellite Program Technical Panel—there were representatives of relevant Government research agencies and private scientific specialists.

International Astronautics, the Army Ballistic Missile, the Third Reich's Rocket Division, L. Whipple and Fred Si... respectively; and ONR... the ONR. These men... program should be put i... possibility of using the... German V-2, and the Lo... This combination, he cl... work. All agreed that a... for military and prestige... tially permit only a sn... instrumentation. Two r... authorized by the Chief... Operations to proceed... satellite program, using... Project Orbiter.

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satellite launchings be attempted as part of the IGY research effort.* It then called upon the Academies of the two countries capable of undertaking such a mission—the United States and the Soviet Union—to seek authorization for the satellite mission.

In America there had been scientific support for a satellite mission for some time. In 1954, the Space Flight Committee of the American Rocket Society (ARS)—the private professional association of atmospheric scientists and aeronautical engineers—filed a report with the NSF about the utility of earth satellites for scientific research. This report culminated several years of effort to interest the government in a scientific venture into space and, in the opinion of some observers, “was the spark plug that ignited the space satellite idea. [The ARS’s] work had a tremendous influence on the NSF when that institution had to decide whether artificial satellites were to be recommended.”⁶

The NSF was soon charged with this responsibility. In March 1955 the US National Committee for the IGY, in response to the CSAGI’s directive, completed a feasibility study and endorsed an American earth satellite project in a report to the National Academy and to the NSF. The NSF, as the governmental agency responsible for expediting the IGY, and as the major advocate in government for scientific affairs, approved the National Committee’s proposal for an instrumented, scientific satellite and forwarded the proposal to the President.

In April 1955, upon the recommendation of the NSC, Eisenhower ordered the Secretary of Defense to “develop the capability of launching a small scientific satellite by 1958 under the auspices of the IGY.” He also instructed the DOD to review various satellite proposals and to recommend “an equipment program and operating structure” by August 1, 1955. At this time the NSC issued one significant reservation: that the satellite project was not to interfere with the development of military rocketry—then so critical in the “balance of terror.”⁷

Assistant Secretary Quarles was responsible for executing the President’s order. In April or May, Quarles convened the Advisory Group on Special Capabilities, or Stewart Committee, a civilian body of eight members chaired by Dr. Homer Stewart, Professor of Physics at UCLA. The services and Secretary Quarles each proposed two members. The Committee reviewed the three proposals:

*The CSAGI proposal declared that “in view of the advanced state of present rocket techniques, consideration should be given to the launching of small satellite vehicles, to their scientific instrumentation, and to the new problems associated with satellite experiments.” Sullivan, *IGY*, p. 276.

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the Air Force plan a proposal based upon additional stages; and the Army additional stages. T in the light of the pri certain of placing the the IGY and with tl programs.”⁸ The thi scientific utility; an

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THE ESTABLISHMENT OF NASA

the Air Force plan utilizing the Atlas ICBM motor; the Navy proposal based upon an improved Viking rocket with two additional stages; and the Army plan based on the Redstone booster with three additional stages. The Stewart Committee considered the three in the light of the primary question: "What program will be the most certain of placing the most useful satellite vehicle in orbit, . . . within the IGY and with the minimum interference to priority military programs."⁸ The three basic criteria were, therefore: reliability; scientific utility; and non-interference with military programs.

On this basis, the Committee eliminated the Air Force bid as interfering with the development of ICBMs. Then, by a 5-2 vote, the Committee supported the Navy proposal as superior to the Army's on all three grounds. First, the Viking seemed more reliable and needed only two additional stages. Second, the engine for the Viking could be made available without interfering with weapons projects, while the Redstone was itself a military rocket. Third, the NRL had had extensive scientific experience with the Viking, the rocket's second stage, and upper atmospheric research equipment in general. Moreover, the Viking project had been declassified and thus security problems were smaller and the amount of technical data which might be released greater than in the case of the Redstone. There were also indications that the Viking "promised to carry the largest payload with the smallest and lightest rocket vehicle," thus offering the most economical investment.⁹

The majority had among its ranks Dr. Joseph Kaplan, the chairman of the National Committee for the IGY, and Richard Porter, chairman of the National Academy's Technical Panel on Earth Satellites for the IGY. It can be assumed then, that these men thought the Navy proposal had the greatest scientific potential. The two dissenters from the majority view - besides Dr. Stewart himself, who did not vote - were Dr. Clifford C. Furnas, Chancellor of the University of Buffalo, who was soon to replace Quarles as the Assistant Secretary R & D, and Dr. William Pickering who, like Dr. Stewart, was from the Jet Propulsion Laboratory, a contractor to the Army. These men all favored the Army's Project Orbiter as offering "greater flexibility as a launcher for a satellite" - which they deemed crucial in a program as short as the IGY period.¹⁰

Public dissents from the Army followed the release of this report on August 4. On August 14, Chief of Army Ordnance Leslie Simons issued a memo claiming that the Redstone was available and could perform the first orbital flight by August 1957. He also argued that the satellite mission would not interfere with the Redstone missile program, since the missile would already be under production. Finally he cited the Navy's admission that it would be necessary to develop a new Vanguard rocket, rather than depend on an improved Viking. He claimed that the Redstone would be

far more reliable than a new rocket developed within the unusually short period of two years.¹¹

Despite this submission, the Advisory Group stuck to its previous decision, and the proposal went up to Quarles' R & D Policy Council, consisting of eight assistant secretaries and service R & D officers. Again, over Army dissent, the Navy project was recommended. On the basis of these findings Deputy Secretary of Defense Reuben Robertson authorized on September 9, 1955, what came to be called Project Vanguard.¹²

The separation of the scientific satellite mission from the development of military hardware and the Administration's general economy drive tended to relegate Project Vanguard to low priority status within the DOD. Dr. John P. Hagen, director of the Vanguard Project in the Naval Research Laboratory, found that his requests for top priority transmitted through Navy channels to the DOD were "not granted in the form in which [he] asked for them."¹³ On April 2, 1956, the Navy requested that the Vanguard be included in the "S" category of the Master Urgency List of the DOD, the Department's highest priority category for urgent military items such as ballistic missiles. On May 29, the DOD directed, instead, its inclusion as Item #1 in Category "1", outranked by the items in Category "S". Hagen made a subsequent request for Category "S" status in October 1957, which was approved on November 7, four days after the launching of Sputnik II. Furthermore, the Office of the Secretary of Defense funded the project from its emergency fund, with frequent delays and penurious oversight until August 1957, when Congress appropriated \$34.2 million to complete the project. At various times back-up programs for the Vanguard were suggested, in case the NRL failed to meet the IGY schedule. As early as August 24, 1955, the R & D Policy Council unanimously recommended that the time-risk factor in Project Vanguard be brought to Secretary Wilson's attention to determine whether the Redstone should be established as a back-up. In 1956, the ONR requested an additional launching pad and six additional satellite launching vehicles. Finally, the National Committee for the IGY suggested to the DOD that six more satellite launching vehicles be scheduled. The Pentagon, however, was already disquieted by the increasing costs of the project and refused these additional requests on economy grounds.¹⁴

While the Navy struggled with its new assignment, the Army continued to push Project Orbiter—and continued to meet with OSD resistance. In April 1956, Dr. Furnas, now Assistant Secretary of Defense for R & D, an early supporter of Project Orbiter on the Stewart Committee, requested the Army to explore the possibility of using the Redstone (Jupiter-C) missile as a back-up

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to the Vanguard. The Army immediately did so, and found that with some development and retooling, the Jupiter-C could fire a satellite in January 1957, several months before the Vanguard's scheduled deadline. On May 15, however, Lt. Gen. James M. Gavin, Deputy Chief of the Army Office of Research and Development, received a directive from William Holaday, Special Assistant to the Secretary for Guided Missiles, that "without any indications of serious difficulties in the Vanguard program, no plans or presentations should be initiated for using any part of the Jupiter or Redstone programs for scientific satellites."¹⁵

Nevertheless, the Army Ballistic Missile Agency was proceeding to develop the Jupiter IRBM with a recoverable nosecone, based upon the same engine design and preliminary hardware work done on Project Orbiter. In September 1956 the Army launched a Jupiter-C missile with its solid fuel upper stages in satellite configuration, and with sand in its fourth stage in order to test nosecone recovery. The test missile was a brilliant success, flying 3300 miles and 600 miles up into outer space. According to Maj. Gen. J. B. Medaris, Commander, ABMA, USA, "We had on hand a back-up missile for that one still in the original (Orbiter) satellite configuration, and at varying times during this period we suggested informally and verbally that if they really wanted a satellite we could use that back-up missile as a satellite. In various languages, our fingers were slapped and we were told to mind our own business, that the Vanguard was going to take care of the satellite problem."

Again, in November 1956, Medaris sent a proposal through Brucker to the OSD, suggesting that the Jupiter-C's proven and available hardware could be spared from its military mission, and should be used to launch a satellite. In June 1957, the OSD sent back to the ABMA a reminder of the May 15, 1956 directive which had instructed the Army to stay out of the satellite business. Indeed, by this time the ABMA campaign for the satellite mission was thoroughly irritating to the OSD. It was in this context that Secretary of the Army Brucker had to state publicly that same month that "the Army did not covet any part of the Navy's mission" and that the Army considered the satellite program to be in capable hands. Furthermore, Brucker sternly added, an Army satellite would be "gross interference in and duplication of" the Navy's mission and the Department of the Army was "embarrassed" at renewal of the request by the ABMA.¹⁶

Faced with this official opposition, the ABMA and Army R & D personnel fell silent. Gavin, Medaris and von Braun watched through the summer as the Vanguard met more delays and as the Soviets moved closer to launching. Gavin testified that he met with

a group of civilian scientists in the Army on September 12 and after "worrying for two weeks" prepared another proposal for the DOD to authorize an Army satellite program on a crash basis. "We did not send that out and, of course, on the fourth of October they launched."¹⁷

In retrospect Medaris found the experience "somewhat incredible." Gavin termed it "very frustrating—and that is an understatement." Politically, however, it was consistent with all the administration's stated positions: its determination to separate the development of the satellite launching vehicle from that of any military missile program; the fact that the administration conceived the satellite program not as a prestige race with the Soviet Union but as a purely scientific endeavor; and finally, the relatively low level of financial and administrative support which the Administration and particularly the highest echelons in the DOD gave to the satellite program.¹⁸

The limited nature of the space program prior to Sputnik was not due to a lack of information about Soviet advances in the field. Both the military R & D groups involved in space and civilian participants in the IGY knew by late 1954 that the Soviets had established an Interdepartmental Commission on Interplanetary Communication in the Soviet Academy of Sciences. It was known that Soviet programs utilized military ICBMs and that the Soviets were placing highest priority on the space mission. In January 1955, Radio Moscow announced that the launching of earth satellites would be possible in the near future. In August 1955, in response to the White House announcement of the American Satellite program, Leonid I. Sedov, Chairman of the Interdepartmental Commission on Interplanetary Communication, announced that the launching of satellites larger than those proposed by the US would be possible within two years. In June 1957, *The New York Times* reported Russian assertions that rockets and instrumentation for a satellite project were prepared and that a satellite would be launched in a few months. In July, the Soviet magazine *Radio* requested amateur radio operators to watch for signals from Sputniks. September 18 brought a Moscow Radio report of an imminent launching. The disinterest expressed by the public at large at this news only mirrored the limited dimensions of official concern.¹⁹

It was in this atmosphere of public unconcern, service competition, and the administration's interpretation of the satellite program as a research venture essentially unrelated to matters of high policy, that A. N. Blagonravov, the chief Soviet delegate to the International Conference on Rockets and Satellites of the IGY, left Moscow for the Washington meetings on September 30. At the airport, he remarked to American reporters, "We will not cackle

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The Launching of Sputnik: October 4, 1957

On October 4, 1957, a reception in honor of the Rockets and Satellites of the IGY was held at the veteran science reporter's telephone. It was then that Radio Moscow had John J. Sullivan relayed the news of the International Council on the Festivities to announce

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until we have laid our egg."²⁰ He undoubtedly expected, however, that he would not have to wait very long.

The Launching of the Sputniks and the Spread of Political Conflict: October 4–November 4, 1957

On October 4, 1957, the Soviet Embassy in Washington held a reception in honor of members of the International Conference on Rockets and Satellites. Shortly after five p.m., Walter Sullivan, veteran science reporter of *The New York Times*, was called to the telephone. It was the *Times*' Washington Bureau with the news that Radio Moscow had just reported the launching of a Russian satellite. Sullivan relayed the news to Dr. Lloyd Berkner, chairman of the International Council of Scientific Unions, who then interrupted the festivities to announce:

I've just been informed by *The New York Times* that a Russian satellite is in orbit at an elevation of 900 kilometers. I wish to congratulate our Soviet colleagues on their achievement.²¹

Despite the scientific acclaim which greeted Sputnik I, as the news went out over the wires the event was soon drowned in its political implications. The impact of Sputnik upon the American public was intense. Six months after its launching, 91 percent of a sample population polled by the Survey Research Center at the University of Michigan had heard of the satellite. Of the 64 percent who attributed some purpose to the American satellite program, almost 33 percent believed it to be in direct competition with the Russians'. While the fear and astonishment noted in the populace just after the Russian launching abated as American satellites went up, two major implications of the Sputnik continued to disturb groups polled. First, the launching had revealed that the Russians possessed a significant rocket and missile capability, with obvious military implications. Second, and more generally, American public opinion was startled by a Russian achievement in what Americans believed to be their own special province: scientific and technological capabilities.

In addition to this shock and dismay, Sputnik also engendered in the American public willingness to make sacrifices in order to match Soviet space achievements. This national reaction brought with it a shift in American public opinion. In the immediate post-Sputnik period, there was a significant decline in confidence in the Republicans as the party best equipped to deal with national problems. In most foreign policy and national security decisions, the American polity is content to follow the leads of the administration. Sputnik, however, in Gabriel Almond's terms, "sprung opinion loose from executive support and dependence for a brief interval".²²

From a limited conflict within a small segment of the military and scientific elites, space suddenly grew into a major national conflict embroiling the administration, the entire military establishment, the scientific community, Congress, and the public at large in a political issue which was to ramify through many facets of American life. The reactions of nationally known political figures to Sputnik now created a broad arena of national debate which brought into question America's political leadership, scientific and technological capabilities, educational system, defense policy, and, indeed, her very potential for national survival. The year of the Sputnik had begun, and with it the birth of NASA.

THE ADMINISTRATION

At the outset of the new debate it was plain that the administration had miscalculated the political significance of Soviet technological virtuosity. This miscalculation can ultimately be attributed to the President, the apex of the American political system. It had been Eisenhower's choice, among contending advisory opinions and organizational biases, that determined the scientific nature of Project Vanguard. Thus, after Sputnik, the President's responses in the new conflict became the focal point for other actors' reactions in the now enlarged political arena.

Of necessity, Eisenhower had to evaluate the launching of Sputnik I in terms of its implications for national security, partisan politics, the power of the executive branch, and the program of his own administration. With immediate evidence that a strong, perhaps even hysterical, public reaction was setting in, the President faced prospects of a radical realignment of his previous bases of support.

In this posture of political defensiveness, Eisenhower's first reaction was, not unnaturally, to attempt to contain the scope of the conflict. Thus, the initial White House communiques minimized the significance of the launching and tried to suppress the rising political storm.²³ In his news conference on October 9 Eisenhower emphasized that ballistic missiles had consistently and properly received more priority than satellites; that the only Soviet victory was in political propaganda; and that his scientific and military advisers assured him there was no need to accelerate defense programs. After discounting the military significance of Sputnik, he sought to calm the nation by relating that his apprehension about national security had not been raised "one iota."²⁴ Moving to the scientific argument, he asserted that the satellite program had "never been considered as a race," merely as "an engagement on our part" and that "in view of the real scientific character of our development,

THE ESTABLISHMENT

there didn't seem to be about it."

From the beginning to produce the map was sold to me on the scientists should before anybody else

When queried about it at least some newsman responded that he had don't know what we concluded he would be fuss was about. After a in the air."

Others interpreted criticism, and positive President began turn whose interests would ing, if necessary, a President's "official face of executive department moved initially to his Special Assistant She Wilson, Clarence R. F international economist Dulles, Senate Minority President Richard Nixon President's position. hower selected to voice and its intention to whose political future President himself, then from Eisenhower's personal political attack

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From the beginning, the whole American purpose . . . has been to produce the maximum in scientific information. The project was sold to me on that basis . . . I don't know of any reason why the scientists should have come in and urged that we do this before anybody else could.

When queried about what America could have done to avert what at least some newsmen were interpreting as a crisis, Eisenhower responded that he had done "everything I can think of . . . and I don't know what we could have done more." Finally, in a personal conclusion he would later regret, he sought to find out what all the fuss was about. After all, "the Russians have only put one small ball in the air."

Others interpreted Sputnik somewhat differently, and as shock, criticism, and positive suggestions appeared in all quarters, the President began turning to those of his institutional supporters whose interests would be served in allaying, if possible, or retrieving, if necessary, a rapidly deteriorating political situation. The President's "official family", his staff, the Vice-President, the heads of executive departments, and the Republican leaders in Congress, moved initially to his defense. In the month following Sputnik, Special Assistant Sherman Adams, Secretary of Defense Charles Wilson, Clarence R. Randall (a special assistant to the President for international economic affairs), Secretary of State John Foster Dulles, Senate Minority Leader William Knowland, and Vice-President Richard Nixon all sought to sustain the tenor of the President's position. Alternatively, it was this group which Eisenhower selected to voice the guarded concern of the White House and its intention to "do something" about Sputnik. These men, whose political futures were more or less dependent upon the President himself, thus attempted to remove the onus of the crisis from Eisenhower's shoulders in order both to defend him from personal political attack and to preserve his freedom of action.

Randall and Adams, both personal assistants who had no bases of influence except those derived from the President, and Wilson, the outgoing Secretary of Defense, were the most outspoken belittlers of the Russian achievement. Randall, in an off moment, dismissed the satellite as a "silly bauble . . . a bubble in the sky."²⁵ Adams, in the same vein, asserted that the American satellite program sought to "serve science, not high score in an outer space basketball game."²⁶ Wilson merely repeated what he had said all along: that the Sputnik had nothing to do with military preparedness or relative missile capabilities. These men had nothing to lose from

such uncritical assertions. Moreover, their statements, while not reflecting the growing political concern within the administration, served definite purposes. It was important that defense of the administration be voiced so that its moves to correct the situation would appear to be starting from the highest possible threshold.

Other spokesmen for the President, notably Dulles, Knowland, and Nixon, had to voice support of their chief within the limits imposed by their other political obligations. Although enjoying the complete confidence of the President, Dulles was still forced to consider the concerns of his department and the views of his critics. Thus, it was in his interest both to support the President and to minimize damage to his own special province by pursuing foreign policy moves in the space arena at once appealing to the President and to his own critics.

The Soviets had been making extraordinary mileage out of their achievement, and editorial comment from both neutralist and allied countries showed that Sputnik was one of the most stimulating events of the recent past. In response to this barrage of successful propaganda, Dulles took two tacks. Sharing in part the immunity from political pressures of the President's personal advisers, he belittled the Sputnik and emphasized the contributions of German scientists to the Soviet satellite program.²⁷ On the other hand, he did embark on two new policy ventures. First, he initiated moves toward cooperation with NATO allies in scientific and technological efforts, and asked for an amendment of the Atomic Energy Act of 1954 to permit such cooperation.²⁸ Second, he used outer space to untie the "inseparable" package of disarmament proposals which the West had offered in London, thereby proclaiming America's interest in the use of outer space for peaceful purposes.²⁹ Thus Dulles could claim for Eisenhower that the United States had initiated definite new policies in the international politics of outer space.

On another political front, Senate Minority Leader William Knowland represented the President in a congressional arena that was becoming increasingly involved in the missile and satellite issue. Knowland, as the leader of the President's party in the upper house, was obligated to defend the administration's posture. At the same time, Knowland was obliged to protect his own role in a legislative branch constitutionally divorced from the executive. Moreover, Knowland at this time harbored presidential ambitions. Thus he, more than Eisenhower's personal advisers or even Dulles, had to maintain a degree of distance from the President's own position.

Knowland appeared to compromise his various political obligations. By calling for a "bipartisan review" of the entire defense effort, he fulfilled his senatorial role; by arguing that politics should

THE ESTABLISHMENT

be ignored in assessing the administration's defense of the national security program" was designed to be business as usual and to be a favorable light on the administration.

Finally, Richard Nixon's shifts which were to come in the next months. His own strategy was complex. As a president he had to afford to identify himself with the administration. At the same time, as he was dependent upon Eisenhower. Thus, Nixon's Sputnik within the administration chose.

In a speech on October 11, 1957, Nixon would be forthcoming in stating that the nation must place its bet on the administration's previous advocacy of high spending and order to win credibility in defense. Although many between past governments, Nixon did argue intelligently to [Sputnik] basic tenets of his campaign. "the Soviet Union is the satellite was launched in the administration shift in the administration however, make no grand scientific stunt."³²

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be ignored in assessing past responsibility and future plans, he defended the administration as best he could.³⁰ His position that the national security program needed regular review "from time to time" was designed both to make the congressional action seem like business as usual and to put any future policy shifts of the administration in a favorable light.³¹

Finally, Richard Nixon served as the spokesman for the policy shifts which were to occupy the administration in the subsequent months. His own strategic position could be characterized as complex. As a presidential aspirant, Nixon logically could not afford to identify himself too closely with the mistake of the President. At the same time, as heir apparent of Modern Republicanism, Nixon was dependent upon the sustained reputation and prestige of Eisenhower. Thus, Nixon both advocated effective responses to the Sputnik within the administration and announced those which the President chose.

In a speech on October 15, Nixon first indicated that some action would be forthcoming in response to the Sputnik by stating that the nation must place its security before a tax cut. Given the administration's previous advocacy of governmental economy, this linkage of high spending and national security was a necessary move in order to win credibility for any future plans to bolster the national defense. Although making no direct reference to the connection between past government economy and the pace of the Vanguard project, Nixon did argue that America "must react . . . strongly and intelligently to [Sputnik's] implications." He did not abrogate the basic tenets of his chief: "Militarily," he assured his audience, "the Soviet Union is not one bit stronger today than it was before the satellite was launched." Yet he did reflect the forthcoming shift in the administration's emphasis when he added, "we could, however, make no greater mistake than to brush off this event as a scientific stunt."³²

The President not only sought to limit the conflict by enlisting his supporters in a public attempt to downgrade Sputnik. He also attempted to enlarge current programs and to initiate, within the executive branch, new efforts which might speed America's space effort, thereby preempting his critics. His immediate policy moves were in three major directions: increased emphasis upon the missile program; high-level consultation with representatives of the scientific community; and a personal appeal to the people.

In the defense field, the administration reacted to the apparent Soviet lead in rocket thrust capability by ordering a stepped-up missile program. Although this would entail no major increase of funds, rumors became current that the President would permit the DOD to spend above its \$38 billion ceiling if such action were neces-

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responsible to the President and enjoying bases of influence apart from him, the DOD simultaneously supported Eisenhower and attempted to direct his choices toward departmental goals.

By an ironical twist of fate, Secretary of Defense-designate Neil H. McElroy was visiting the ABMA arsenal at Huntsville when Sputnik went up. Back in Washington four days later, the Secretary gave no evidence that what must have been a roaring good conversation over lunch had produced any policy shifts in the satellite program. Together with other DOD spokesmen, his public support of the President was unequivocal.

In replying to their civilian and Army critics, DOD officials emphasized the separate nature of Project Vanguard and looked back to the fateful 1955 decision to account for America's comparative position vis-a-vis the Russians. Holaday further observed that the Sputnik "was not evidence of Soviet technological superiority in missiles and rocket development"³⁶ and SHAPE headquarters assured reporters that there were no military potentialities of earth satellites of which it was aware.

The Defense Department bore the brunt of such public debate, since it was charged with operational control over a satellite program which administration policy had failed to exploit. In addition, the Soviet ICBM capability directed attention to American missile efforts. While such attention intensified the department's effort to fend off critical attack, it simultaneously enabled the military establishment to pursue the new mission openly. The DOD stood to gain from an American space program if this program were primarily military in emphasis, and the department capitalized upon the absence of clear-cut space policy to assert its own claim.

McElroy revealed the department's new concern by a series of immediate policy decisions, all of them contributing to a space effort. In the field of military support for scientific research and development, the Secretary revoked former Secretary Wilson's August 17 directive reducing service test and evaluation expenditures.³⁷ He returned basic research funding, which had been reduced to compensate for overexpenditure earlier in fiscal year 1958 to its original appropriations level, thus augmenting available funds by \$9 million.³⁸ Further, the Secretary lifted certain overtime restrictions on missile development work.

In the ballistic-missile field, McElroy announced that he would assume personal direction of the program, ordering weekly service progress reports and declaring himself constantly available to discuss any problems. Like the President, he believed the program basically sound, and emphasized that removal of technical and administrative bottlenecks would suffice to speed it on its way. His heightened interest, however, attested to both the administra-

tion's increased evaluation of the Soviet ICBM capability, and its willingness to consider a larger American effort.

Finally, in the space field the DOD gradually shifted to a new emphasis upon prestige and military objectives. The services' reactions varied with the level and success of their respective space roles. The service directly responsible for the ongoing satellite program echoed the DOD's initial reaction to Sputnik. Rear Admiral Rawson Bennett, Chief of Naval Research, depicted Sputnik as "a hunk of iron almost anybody could launch."³⁹ His commanding officer, Admiral Arleigh Burke, Chief of Naval Operations, supported this contention by arguing that America had rocket power sufficient to launch a satellite of Sputnik's weight. There was some internal opposition to this official sanguinity. Rear Admiral John T. Hayward, Assistant Chief of Naval Operations, Research and Development, later indicated that there had been some reappraisal of Project Vanguard within the Navy at this time. "When Sputnik went up and everything was confused I made the same proposals that you gentlemen have gotten legislation for now. And I was slapped down pretty hard."⁴⁰ Like the President, however, the DOD and Navy officials publicly dismissed the existence of a space race in which the United States had not yet crossed the starting line.

Army spokesmen took a more parochial tack. Civilian scientists within the Department of the Army and the Huntsville team immediately reminded the news media that the Army could have launched a satellite in 1956. Indeed, four days after Sputnik at the Eighth International Astronautics Federation Congress in Barcelona, Major General Holgar N. Toftoy, Commander of the Redstone Arsenal, and Brigadier General John A. Barclay, Department Commander, ABMA said an army satellite could have been up in 1955. To this Barclay cryptically added that the wisdom of the Vanguard decision "remains to be evaluated."⁴¹

A small stir ensued within the department. The next day the Office of the Secretary of the Army issued an order to Army personnel that any public statements about the Army's satellite or ballistic-missile capabilities were inappropriate and therefore banned.⁴² Shortly thereafter, both the Navy and the Air Force issued similar directives since, as the Air Force explained, "any comments are almost certain to be misunderstood."⁴³

Indeed, comments were guaranteed to be misunderstood, since the DOD's public position at this juncture was an uncomfortably composite one. Nonetheless, the department was moving into the space field. The Air Force immediately accelerated its high-altitude research rocket firings, Project Farside, in an attempt to offset the impact of Sputnik. The first news of these firings was of reported

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THE SCIENTISTS

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failures and the Air Force refused to comment on the project.⁴⁴ The acceleration was significant, however, since only a few months before the DOD and the Air Force had curtailed the mission. In the ill-starred Vanguard program there was no order to accelerate. Such a course was considered, but further evaluation revealed that it would be a sufficient technological feat to keep the project on schedule. Furthermore, a crash effort would seem like "me-tooism." Instead, for the first time, the DOD turned to serious consideration of long-term, large military space projects. In the days following Sputnik, the Air Force received a sympathetic hearing on its reconnaissance satellite program, and von Braun was invited to present an Army proposal for a circumlunar space platform.⁴⁵ Although these proposals would not become operational for several years, their review by the DOD revealed a new interest in space efforts which might outstrip the Russians. No longer were such futuristic projects considered science fiction; no longer was outdoing the Russians for prestige purposes considered beyond the mission of the DOD.

THE SCIENTISTS

Perhaps the most significant impact of Sputnik was that it focused upon scientific and technological prowess as both a major factor in cold war competition and as a major component of national preparedness. In the months following the launching, national interest in scientific affairs and in the state of American science and technology increased markedly. Libraries reported increased circulation of scientific literature; department stores reported increased sales of binoculars; local government officials reported increased attempts at amateur rocketry; and newspapers devoted more space to scientific news.

In October 1957 the American scientific community had no clearly defined role in the highest echelons of public policy-making. A number of distinguished scientists and engineers had been alienated from government work in the McCarthy era, and their outlook reached its peak of disaffection in the years after the Oppenheimer security hearings. The military services and some other executive departments had established scientific advisory committees, but the highest level of formal scientific participation in the Executive Branch was in the Office of Defense Mobilization.

Sputnik signaled the reappearance of the scientists as important members of the national political system, but with uncertain objectives. From their earlier participation in Project Vanguard, the scientists bore a certain responsibility for the American position.

As scientists, however, they appreciated the Russian accomplishment. Hence, a strong flavor of ambivalence characterized the immediate reactions of the scientists to the launching. Some expressed admiration for a significant scientific feat; others were critical of the low priority given Project Vanguard and of the rejection of Project Orbiter. Underlying both attitudes was a general concern that American scientific progress and educational standards were rapidly being surpassed by the Soviet Union.⁴⁶ Moreover, many scientists cited Sputnik as evidence of Soviet ICBM capacity and suggested that America undertake a vast program of scientific research and development to match it. Their suggestions had impact. Torn between traditional respect for the international achievements of science and concern for America's welfare and security, the scientists suddenly had substantial opportunities for influence.

In the first days after Sputnik it seemed clear the scientists intended to use their opportunities. The administration was prepared to give careful attention to their views. And as private and public debate intensified many scientists sought to broaden the agenda of subjects for high-level consultation beyond the obvious fact that the scientific satellite program needed increased support. Instead, they called for—and secured—a general review of all government scientific policies by Eisenhower's new-found official scientific advisers.

Their voices, in turn, were heard. On November 3 John Finney reported that "for the first time, in the past weeks top government officials have been heeding the advice of scientists and educators."⁴⁷ Although the scientists did not at this time offer a clear policy of what they wanted in space, they had gained access to the President and a right to be consulted by him in future space policy.

THE CONGRESS

After Sputnik, the key institution which determined whether or not and, if so, how far the political conflict would be broadened, was the United States Congress. With the administration following a policy of reassurance, continued high political visibility of the satellite program seemed possible only if powerful congressional leaders chose to maintain it. Such was the character of the issue that it almost guaranteed an initial reaction—for it served many purposes of many legislative members.

The immediate and predictable response of virtually all congressmen to Sputnik was a rash of public statements commenting gravely upon the seriousness of the situation. Quite beyond the

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chance for general publicity, however, there were other gains to be achieved for the parties and subparties within Congress, key leaders, and important committees.

On a party basis, reactions to the launching divided, as might be expected, four ways. The liberal Republicans had to defend Eisenhower and at the same time push him into policy decisions which would maintain his, and hence their, prestige. Accordingly, they were most anxious to limit the conflict engendered by Sputnik. Conservative Republicans, less loyal to the President, were cross-pressured by concern with the Russian advance and their long-time advocacy of the balanced budget. Their reactions were more critical of the President than those of their liberal brethren, and thus less designed to contain political conflict. Predictably, liberal Democrats were the chief opponents of the administration, anxious to evaluate the space program in a partisan context. But the group most interested in expanding the conflict engendered by Sputnik were the moderate Democrats, particularly the two Texans who then, in concert, led the legislative branch of the government.

Lyndon Johnson, Sam Rayburn, and their followers had in their own view more to gain from the crisis and more influence by which to achieve their ends than any other segment of Congress. Their ability to shape congressional policy and their decision to capitalize upon the issue became the crucial factors in determining the scope and intensity of the conflict.

Both segments of the Republicans were on the defensive. Moderate Republicans, in order to maintain their own and their party's standing with an aroused public, sought to save the President, even if in their view he would not save himself. Senators Javits and Case and Representative Keating all called for greater coordination of the missile and satellite program and greater defense expenditures, maintaining that government economy must be subordinated in times of crisis. Their simultaneous appeal was that partisan criticism should be avoided lest it impede the defense effort; keeping politics under the rug was a condition of their strategy's success.

These spokesmen were joined by Senators Bridges, Saltonstall, and Flanders, all senior Republican members of the Armed Services Committee with relatively safe Senate seats. However, they placed more emphasis on program needs and less on party interests. Bridges, who led his party in the defense debate, was the most outspoken. He joined the Democrats in demanding a full-scale Senate inquiry into the defense effort and attacked "ostensibly responsible spokesmen for the Administration for grossly misleading statements belittling Sputnik," an obvious reference to Randall and Adams.⁴⁸ He called for less concern "with the depth of the pile on

the new broadloom rug or the length of the tailfin on the new car, and [greater readiness] to shed blood, sweat and tears if this country and the free world are to survive."⁴⁹ Like the liberal Republicans, Bridges abjured partisanship, not because he feared its use against himself, but because it might place limits upon his Senatorial autonomy as a rather swashbuckling critic of the administration.

Few orthodox Republicans were this immune to the political risks of protesting too much about the administration's defense posture. As conservatives, some were legitimately concerned about the expenditures which a stepped-up space program would require. Others, faced with hard campaigning in the fall, needed presidential and party prestige for their own career purposes. Thus, some conservative Republicans discounted the Soviet achievement in the same way Eisenhower's close advisers had done. Homer Capehart evaluated the launch as "psychologically bad, but practically it doesn't mean much."⁵⁰ Alexander Wiley saw it as nothing to worry about, but rather as "something to keep us on our toes."⁵¹ Logically, it was this group which consistently accused the Democrats of playing politics with national defense.

Senator Knowland stood midway between the two Republican positions. Harboring strong political ambitions and a high regard for his own autonomous power as leader of the Senate's Republicans, the Minority Leader vacillated between support of an inquiry into defense policy and castigation of Democratic partisanship. His behavior reflected a thorough realization that the forthcoming session of Congress could bode no good for the Republicans, and that it was in the majority party that the congressional response to Sputnik would ultimately be fashioned.

As the majority party, the Democrats initially responded to the challenge of Sputnik with an attack led by their liberal wing. On the evening of October 4, Senators Symington, Jackson, Mansfield, Smathers, Anderson, Humphrey, and Kefauver were already placing responsibility for the Soviet space advantage on Eisenhower's lack of leadership and program of economy-above-all. They demanded that the missile and scientific space programs be accelerated and coordinated, and called for investigations and a special session of Congress. They scored "the soothing platitudes of the Administration spokesmen"; termed Sputnik a "devastating blow to the prestige of the United States as a leader in the scientific and technological world"; and called upon the President "to assume personal responsibility for speeding the missile program."⁵²

Similar sentiments were voiced by ranking leaders of the national party, Truman, Stevenson, Harriman, Butler, and Benton. On October 11 the Democratic Advisory Council of the Democratic National Committee issued a statement charging that "the Russian

achievement is visible to all and it is our duty to understand the American position in the world. Basic research and development are inferior to the Russian position. That the administration that, had Truman's administration, the United States would have the President to be attacked both Republican and Democratic in particular, Ike's halo out alto, Democrats who would

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achievement is visible proof that the administration has failed to understand the amount of effort which is needed by our country in basic research and in applied engineering if we are not to become inferior to the Russians."⁵³ In rapid-fire order the council charged that the administration valued economy above security; claimed that, had Truman's missile program been sustained since 1953, the United States would never have been surpassed; and called upon the President to be a leader. Former President Truman chose to attack both Republicans in general and the Republican administration in particular, announcing that in the 1958 elections "we'll rub Ike's halo out altogether."⁵⁴ At the least, there were obviously some Democrats who were gleefully preparing to try.

Despite the sound and fury, Senator Lyndon Johnson was the chief architect of the Democrats' ultimate strategy. He was equipped with the formidable political resources of a Majority Leader. He was a moderate capable of pulling the disparate elements of the Democratic party into effective voting coalitions; a powerful member of the Senate Armed Services Committee; a man of political flamboyance sufficient to gain the public's attention; and had political ability sufficient to gain almost anything he set out to get. Although master of only one-half of Congress, Speaker Rayburn was his devoted friend, mentor, and supporter. Johnson had a deep loyalty to and faith in the Democratic party and firmly believed in the congruence between what was good for the Democrats and good for the nation. He was vitally concerned with the nation's security. And, finally, he wanted to become president of the United States.

To Johnson it seemed that he and his party could reap the greatest political rewards from Sputnik by working with, but consistently ahead of, the administration. In this posture, the Democratic leadership in Congress, with the aid of liberal Republicans and the more partisan Democrats, could appear as the defenders, indeed the architects, of national preparedness. Johnson feared that a partisan attack upon the administration might backfire into countercharges of Democratic politicking with national survival. Yet he had no intention of declaring that politics stopped at the atmosphere's edge. (Von Braun was later to comment that "space was bigger than Texas." This did not necessarily make it any different.) Thus Johnson's statement shortly after Sputnik that the Soviets were first in space "due to the lack of intelligent, united effort in the United States" appeared as an appeal to united effort on behalf of his own prospectus for military preparedness.⁵⁵

Johnson worked swiftly to establish his position.⁵⁶ Senator Symington, a long-time critic of the administration's defense effort, had greeted Sputnik with pleas for both a special session of Congress and an investigation of the national defense effort by the Senate

Armed Services Committee. Upon reaching Chairman Richard Russell he was informed that Johnson had already set an investigation in motion, although diluting its partisan flavor by calling it an "inquiry." On the day after Sputnik, the staff of the Senate committee and members of Johnson's personal staff were already collecting data. Chairman Russell waited to call the inquiry until he could contact Senator Styles Bridges, the ranking Republican on the committee. When he did so, he found that Johnson had already arranged matters in agreeably bipartisan fashion. Thus Johnson initiated the Senate Armed Services Committee's Preparedness Subcommittee's "Inquiry into Satellite and Missile Programs." The inquiry would serve as an arena in which the whole defense posture of the Eisenhower administration would be examined and found, under the aegis of Johnson, most seriously wanting. It would also serve as a vehicle by which the Democratic Party in Congress, again under Johnson, would offer the nation a program for enhancing its security. Finally, it would put Johnson himself, and his statesmanlike concern for the nation's preparedness, in the headlines of every newspaper in the land.

The Majority Leader was clearly able and anxious to take the initiative in policy-making for national security affairs, including space. His choice to do so, more than perhaps any other factor, guaranteed that the resolution of the space issue would take place in a broad political arena.

THE TAKE-OFF INTO SELF-SUSTAINED STRATEGY

The immediate response of the major political participants to the launching of Sputnik was in all cases a cursory examination of the profits and losses which might accrue to each from the event. The administration and the Congress, representing general political interests within the system, had to place the onset of the space age within the broader context of national security and political climate. They viewed the space program as a channel for the advancement of political values and moved, either defensively or offensively, into the new arena. They recognized that space was becoming a focal point for the generalized concern voiced by their constituent groups.

On the other hand, the military establishment and the scientific community were specifically qualified to assess the potential role of space in the national effort. Although each had other, and at this time more pressing, missions, each possessed technical skills necessary to promote a space program. Moreover, they both recog-

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nized that the markedly increased interest of the political generalists in the field was the means through which they could transform their specialized influence into broad public policy.

In the first month after Sputnik, then, the immediate reactions of the involved political activists determined that space policy would become a genuine political conflict spreading throughout the political system. Once the existence of the space issue had been established, the activists moved to assess their self-interest and strategic choices in regard to it. Questions of who wanted what and how emerged as soon as the arena of competition was recognized. Out of the ensuing conflict would rise the power structure that would establish the new space agency.

Everybody Has a Space Capability: November 1957- April 1958

In early November, while the administration struggled unsuccessfully to contain the controversy generated by Sputnik I, the half-ton dog-carrying Sputnik II intensified public and political concern.

The new satellite was a sobering reminder that the space race was not a one-shot affair, but an urgent, long-term scientific and technological challenge. Immediately after its launching the administration, building upon initiatives of the previous month, began to take actions committing the United States to a space effort. As its intentions became clear, competition for a role in either the technical-scientific or political exploitation of space became clear as well.

The administration spent the five months after Sputnik II evolving its space policy, for the most part behind closed doors. During this period, its posture was to proclaim its intention to build a new space effort but to avoid specific choices. Given this hiatus, other political participants were free to press their own claims while the administration debated its choice, and to make clear their respective positions and policy preferences. The administration's delaying action—necessary in any process of policy formulation—provided the perfect backdrop for the sustained competition of the interested activists.

These other participants set to work first to build strategic positions which might serve them best in procuring a greater role in space. It would be from these positions that the administration's ultimate proposal to establish NASA, submitted on April 2, would be evaluated. For the moment, however, each political participant sought to convince the administration of its own special capability in space by calling loudly for recognition of its skills and resources. It was a veritable "Anvil Chorus."

THE ADMINISTRATION

Although the broad outlines of the nation's space program remained undetermined in the period between November 1957 and April 1958, the administration did make certain interim organizational and budgetary decisions to speed up the present effort. But these limited steps did not suffice to stave off the critics—throughout this period the administration remained on the political defensive. Its behavior was due in part to a continuing desire to contain the conflict as far as possible. It was also dictated by the special requirements of the executive office in the American political process.

The nature of these requirements demands a brief explanation. The heart of the administration's problem was that, while critics could call for an all-out space effort, the administration itself could treat space only as one part of a broad national security effort. Necessarily responsible for the entire policy spectrum of the government, the administration's ability to focus upon and exploit the space effort was more limited than that of its critics. Thus, no matter what the magnitude of the official effort, critics could always complain.

Yet at the same time any administration can more easily establish the magnitude of national security policy, including space, than any other field of national policy. The "arena of decision-making"⁵⁷ for national security lies primarily in the executive branch; without enormous effort, neither the public nor the Congress can significantly alter the strategic choices of the administration, once they are made. Thus the administration could, within limits dictated by its desire for political survival, afford to accept criticism of its space effort, expecting that, once questions of character and magnitude were resolved within the administration itself, it would regain its traditional initiative.

Thus the administration was neither able nor impelled to shout its critics. Instead it acted to preserve its own freedom of choice, so that it could later exploit the relative congressional acquiescence and latent public support which exists for national security policy. As events were to disclose, this was a politically viable posture. Moreover, because it was a relatively conservative choice, it fitted the administration's fiscal and partisan philosophy.

So far as public statements were concerned, Eisenhower's attitude toward the space challenge during this period was one of serious calm. He reassured the nation that it was not in severe danger. His State of the Union message stressed that the present American deterrent capability was sufficient to wreak annihilation on the

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Soviet Union, thus to the United States wisdom was the ultimate "both what we must. Throughout the entire two themes: inviting disparaging partisan back their shoulders strong and will grow.

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Soviet Union, thus discounting any "real and present danger" to the United States. He also reiterated the theme that economic wisdom was the ultimate defense and that America could not have "both what we must have and what we would like to have."⁵⁸ Throughout the interim period the President constantly plied these two themes: inviting national consensus in support of his program; disparaging partisans and alarmists; and urging Americans to "throw back their shoulders, thrust out their chins and say 'America is strong and will grow ever stronger.'"⁵⁹

However inherently strong the administration's power position, it still suffered political damage. Eisenhower's popularity had declined ten percent since the 1956 election and the Sputniks accelerated the trend.⁶⁰ In January, therefore, he was confronted with the most skeptical Congress he had known, one which openly intended to fill the "vacuum" of executive leadership. ///

As in the first days of immediate reaction to Sputnik I, Eisenhower's advisers joined in public defense of their chief. Predictably, Dulles and Adams emphasized only the positive side of the administration's achievement. After Explorer I, America's first satellite, went up on January 31 Dulles observed that "if we put our mind to it, we can do almost anything that can be done."⁶¹ Adams went further and claimed that not only was the administration doing fine, but that any missile lag which might have inadvertently occurred during the present administration was the Truman administration's responsibility.⁶² Alternatively, it was Nixon who presented both aspects of the administration posture. After the Explorer was launched, for example, he both boasted that the U.S.S.R. had no monopoly on scientific achievement and warned against excessive optimism.⁶³ In all cases these spokesmen were speaking for the President; in all cases, too, they implicitly or explicitly asked the nation to trust Eisenhower in defense matters.

Finally, White House tactics sought both to disassociate the President from current difficulties and to associate him with the successes of America's early venture into space. After the Vanguard failure, Hagerty claimed that the White House had in no way been involved in the excessive publicity which surrounded the attempt and which was subsequently widely criticized. He also referred all questions concerning the failure to the DOD.⁶⁴ Yet the announcement of the successful launchings came first from Eisenhower's office. In essence the emergent information policy concerning the satellite program was a simple one. Hagerty revealed it when he remarked to reporters that if Explorer II went into orbit the White House would announce it; if not, the newsmen could get their news from the Army and the National Science Foundation.⁶⁵

The administration did more than talk, however; it made certain

preliminary moves to expand the future space effort. These actions were on three fronts: higher priority for science as a national resource; an expansion of the ballistic-missile and satellite effort; and a more liberal attitude toward the omnipresent pressure to allocate more resources to space activities.

One major step to raise the prestige of science after the Sputniks was the formal recruitment of scientists into the ranks of the policy makers. The presidential conferences of October with scientists and educators began to bear fruit: in a nationwide television speech on November 7, Eisenhower announced the appointment of Dr. James R. Killian, President of the Massachusetts Institute of Technology, as his new Special Assistant for Science and Technology. On November 29 the President transferred the President's Science Advisory Committee from the Office of Defense Mobilization to the White House, thus buttressing Killian with a broadly gauged advisory structure. These moves were intended to "give science an impressive new voice in the inner circle of Government."⁶⁶

At the same time the President sought to put some of the earlier suggestions of scientists and educators into effect: specifically in the areas of scientific education, basic research, and scientific cooperation with NATO allies. In a speech televised in Oklahoma City on November 13, he echoed the scientists' claim that scientific education was the most critical problem facing the nation, and offered initial suggestions which were to become his first legislative proposal in the new national security effort. The administration bill, finally approved as the National Defense Education Act, provided \$1 billion over a four-year period for grants to colleges and technical schools, and graduate fellowships.

To further scientific cooperation with the allies, Eisenhower announced in December a preliminary agreement with Prime Minister Macmillan on joint British and American research activities, contingent upon amendment of the Atomic Energy Act. In support of such cooperation, the White House announced in late December the appointment of Wallace R. Brode, Associate Director of the National Bureau of Standards, as Special Assistant to the Secretary of State for Scientific Affairs.⁶⁷

In the field of basic research, the new fiscal year 1959 budget included a request for \$150 million for the National Science Foundation, three times as much as the actual appropriation of the previous year. The request for the National Advisory Committee for Aeronautics (NACA) was increased more than 50 percent to permit advanced research in space flight. Finally, the DOD requested 50 percent more than in the previous year for basic research applicable to military research and development, including space.

Eisenhower also provided increased funds for national security

including space research, but in marginal amounts. In defense spending, Eisenhower estimated that the 1959 budget would be less than the current one.⁶⁸ (Presidential budget estimates between \$38 and \$40 billion.) This ambiguous statement, however, was Eisenhower's public recommitment to fiscal conservatism to maintain a balance. By January 15, however, he had increased it by \$5 billion.⁷⁰

So far as international relations, Eisenhower continued the policy of November 7 that the Secretary of Defense and the Secretary of State's Missiles vested with authority to coordinate and temporary control. The DOD authorized Project Vanguard on November 15. Macmillan appointed a new director of guided missiles, and to McElroy, who was frequently assigned to make clear his program. As early as 1954, he had stated that the distribution of space upon which the world would remain a primary concern, then stated, in discussing the project.

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By early February, it was clear that this distinction separating military and civilian objectives in space was an organizational

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including space research and exploration, although in relatively marginal amounts. While promising a "very considerable" increase in defense spending, Eisenhower later reversed himself and indicated that the 1959 budget would be only moderately higher than the current one.⁶⁸ (Predicted defense spending in 1959 was to be between \$38 and \$40 billion, as compared with \$38.4 in 1958). This ambiguous posture stemmed from conflict between Eisenhower's public rejection of price tags for defense and his commitment to fiscal responsibility. As late as December he still hoped to maintain a balanced budget and to avoid raising the debt limit.⁶⁹ By January 15, however, he was asking Congress to raise the ceiling by \$5 billion.⁷⁰

So far as interim organizational steps for space were concerned, Eisenhower concentrated upon the DOD. He announced on November 7 that Mr. William M. Holaday, former Special Assistant to the Secretary of Defense, would become the Director of Guided Missiles vested with the full authority of the Secretary to supervise and coordinate the missile program. Holaday was also granted temporary control over the satellite program. The next day the DOD authorized the Army's satellite program as a backup for Project Vanguard. And, most significantly for our purposes, on November 15 McElroy announced that he would subsequently appoint a new director for advanced weapons development, including guided missiles in early stages of research, anti-missile missiles, satellites, and space platforms. Such weaponry, according to McElroy, would be developed by a single manager and subsequently assigned to the services for use. The President also began to make clear his long-range conception of the structure of the space program. As early as his Oklahoma City speech Eisenhower suggested that the distinction between civilian and military exploitation of space upon which the Vanguard decision had been based would remain a primary criterion for assigning the space program. He then stated, in discussing the satellite program:

If the project is designed for scientific purposes, its size and cost must be tailored to the scientific job it is going to do If the project has some ultimate defense value, its urgency for the purpose is to be judged in comparison with the probable value of competing defense projects.⁷¹

By early February there were indications from the White House that this distinction would be institutionalized in arrangements separating military and nonmilitary space programs. On the fourth, Eisenhower ordered Killian to draw up a timetable for scientific objectives in space, with the special charge of matching these with an organizational structure for research and exploration in space.

The following day in his news conference, Eisenhower indicated that he was sympathetic to a division of responsibility: the emplacement of space weaponry in the DOD, and overall responsibility for space sciences in a civilian agency. The President thus distinguished between "what is in the realm of probability in the whole scientific area [and] . . . the defense aspects of this business."⁷²

It is clear that the principle of divided control of the space mission between military and civilian operating agencies had been established when Killian was instructed to draw up his report.⁷³ After this time White House spokesmen substantiated this principle in increasingly forceful terms. On February 17 Nixon stated in a speech at the Jet Propulsion Laboratory that the exploration of space was a civilian task for two basic reasons: first, "research as well as operations in this field [should] not be established by military need and military opinion," since such military limitations would, in Nixon's view, put unnecessary and destructive limits upon scientific investigation. Second, he considered it "vitally important that we continue to emphasize that our efforts [in the space and research fields] are for peaceful purposes."⁷⁴

In late March Eisenhower made his first explicit commitment to civilian control of space: "I expect to send up shortly recommended legislation providing for civilian control and direction of governmental activities incident to a civilian space program."⁷⁵ On the same day he released "An Introduction to Outer Space," the space primer prepared by Killian and his committee, under the direction of Dr. Edward Purcell. This primer outlined a projected program for scientific exploration of space under civilian direction. Finally, on April 2, Eisenhower sent to Congress his message proposing the National Aeronautics and Space Agency with expanded authority and mission to direct all American projects in space, "except for those projects primarily associated with military requirements."⁷⁶ Thus the administration, exercising its crucial role as initiator of the legislative process, chose to formulate the space mission around the key concept that scientific-civilian dimensions of space would be distinguished and separated out from the military dimension.

THE DEPARTMENT OF DEFENSE

The Department of Defense is both a part of the administration and a military establishment vested with the monopolistic mission of defending by force the national security of the United States. This mission requires such vast resources and specialized personnel that the department can exercise a significant degree of independence

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apart from the political control of its commander in chief. Moreover, within the department the services have analogous independent power positions. While outlining the separate space policy positions of the department vis-a-vis the administration and, in turn, of the services within the department, overturns the organization charts, it acknowledges political reality.

The civilian officials in the Office of the Secretary of Defense as members of the administration publicly supported Eisenhower's level of commitment to the space effort. As military officials, however, it was also their duty to impress upon the President the potential military significance of space exploitation. Moreover, each service sought to protect and extend its mission in space in opposition to each other's claims, while together pressing a broad program of space activity upon the civilian officials in the OSD. Thus the DOD was at once an extension of the administration, a single military agent making peculiar strategic demands upon the administration, and a multiple actor expressing divergent service claims of space capabilities. This Janus-faced quality of the DOD makes the task of interpreting its claim upon America's potential space capability a peculiarly complex but equally important one.

The Office of the Secretary of Defense

Throughout the period from November until April, the OSD officials argued consistently that the Sputniks did not reflect an operational Soviet military advantage. However, they did admit the military significance of the powerful rocket thrust which had launched the satellites. Thus, given the department's primary mission to promote the national security, its major reaction to the Sputnik crisis was to accelerate the missile program. To this end, McElroy authorized the production of both the Jupiter and the Thor IRBMs on November 26, speeded development of the Atlas ICBM in December, and authorized research and development on the Minuteman ICBM early in 1958.

In general, the OSD sustained the official position which had led to the Vanguard decision: that the exploitation of space should not hamper the major task of developing America's ballistic-missile capability. On November 11 Undersecretary of Defense Donald Quarles indicated that the United States had rockets capable of lifting satellites as heavy as the Sputniks, but that the DOD did not consider this a proper military use of the vehicles.⁷⁷ In a speech to the American Rocket Society, Holaday repeated this argument, saying:

We will be able to have large satellites whenever we want them. . . . When we are assured of an adequate IRBM capability

and an ICBM system with the necessary support equipment and stockpile of missiles, then we intend to jump into space. To do so beforehand would be like trying to lock the front door and let [sic] the back door stay open. This does not mean that we will discontinue space work. We will have an effective and continuing program. But missiles will be our Number One job.⁷⁸

The exploitation of space, insofar as it contributed to a stronger defense posture, was included within the DOD's overall mission. Its significance, however, would be evaluated relative to the utility of other defense programs.

Despite this formal doctrine the OSD did, however, specifically accelerate the space program in response to the Sputniks. Politically, the Sputniks had proven a disaster. The DOD, while denying responsibility for the initial Vanguard decision, acknowledged that, had the political effects of the Soviet's preemption in space been foreseen, the decision might have been made differently.⁷⁹

The DOD thus assumed increased responsibility for the political dimension of space. On November 8, four days after Sputnik II went up, the DOD authorized the Army's Project Explorer as a supplement to Project Vanguard. As McElroy later explained:

In consultation with my associates, [it was my belief] that there was some doubt... as to the success that would be attendant upon the launching of a satellite by the selected... Navy Vanguard method. We felt that there had been *some evidence that our major competitor in the world was able to do this*. We felt that in the general interest of this country, both nationally and internationally, we should make certain that we would be able to launch satellites for our IGY commitment which went through the year 1958.⁸⁰

The DOD's information policy concerning IGY satellite launchings also reflected this new political concern. The extreme publicity surrounding the Vanguard's first test failure produced extremely adverse domestic and international reactions—in Britain the Vanguard was variously termed the Puffnik, Flopnik, Phutnik, Kaputnik, and Stayputnik. Thereafter, the DOD adopted extremely secretive policies. There were no further press releases concerning preparations for firings, and public announcements were made only after launching attempts.⁸¹

Furthermore, the DOD expressed an immediate substantive interest in military space projects after the Soviet launchings and requested the services to submit proposals for projects consistent with their missions. McElroy indicated that the DOD would undertake an active program in various fields of space exploitation.

THE ESTABLISHMENT

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Soon this recognition of space for military research and development. Despite its early the Pentagon wanted appeared.

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We have felt the responsibility, and do feel the responsibility for any kind of military weapon development, no matter in what field it may reach (It is necessary) to recognize early in the game the importance of some very novel kinds of weapons which some people are likely to brush off as Buck Rogers stuff.⁸²

Soon this recognition of the political and substantive implications of space for military activities led to organizational changes and research and development programing of considerable significance. Despite its early emphasis upon missiles it became clear that the Pentagon wanted a major role in whatever space program appeared.

The first evidence of this policy choice was the organization of existing military space programs. The OSD seized the initiative from the services. On November 15 McElroy announced that he would appoint a new director for the development of advanced research projects: in effect, a single manager for space and other advanced missions. Until this agency could be set up, space would be under the jurisdiction of Holaday, the Director of Guided Missiles.⁸³ McElroy was intent upon this mission being organized within the OSD—precluding the possibility of a service taking over-all control over the incipient space program.⁸⁴

In keeping with OSD's thinking, when the Air Force set up a new Directorate of Astronautics on December 10 to manage advanced space programs within the service, Acting Secretary Quarles announced that he had asked the Air Force to delay such action until the new Advanced Research Projects Agency was organized. Quarles claimed that the DOD, while not opposed to the Air Force plan, considered it "premature."⁸⁵ The issue was closed when Secretary of the Air Force William H. Douglas suspended the order on December 13 under OSD instructions. Department officials felt that "apparently the Air Force wishes to show its ability in this field and see if it can grab the limelight and establish a position."⁸⁶ They took quick action to quash this attempt to usurp the military space mission.

The OSD intent was "an immediate one: to pull under a single manager . . . the first time this has been done in the DOD—actual operating units for the Research and Development work that goes on in the anti-missile missile field and in the satellite and space applications field."⁸⁷ The ARPA was to have authority to develop such weapons and to turn them over to services for deployment and use. McElroy testified that after consultation with all the services the entire DOD was agreed that the new agency should control all activities of any service in these areas.

In December, however, the OSD modified McElroy's announced plan for a single-manager, inhouse-capability agency. Holaday testified that

if this group took off and developed its own engines and everything... it would be wasteful. The planning and thinking... is that we will be a cooperative group, not fighting, and will use the available material [the services] have to help out in [the agency's] program.⁸⁸

This change reflected a serious struggle within the DOD. In competing for particular space missions the services had adopted strong positions for or against the prospect of an all-powerful operating agency for advanced research and development.⁸⁹ Moreover, some outside contractors were criticizing the potential disruption that such an agency would introduce into the contracting procedures of the services.⁹⁰ These arguments respecting the establishment of the ARPA continued for months while McElroy sought a director for the agency.

Thus, as ARPA came into existence, the exact extent of the new agency's potential authority remained unclear. Nonetheless, McElroy's general position had Eisenhower's support. On January 7 the President sent a message to Congress requesting transfer of \$10 million from various military appropriations to the ARPA in the Supplemental Defense Appropriations Bill for fiscal year 1958. This sum would cover the expenses of establishing the agency, including "acquisition and construction of such research, development and test facilities and equipment as may be authorized by the Secretary of Defense."⁹¹ Shortly thereafter, in the State of the Union message, Eisenhower argued that

some of the important new weapons which technology has produced do not fit into any existing Service pattern. They cut across all Services, involve all Services and transcend all Services at every stage from development to operation. In some instances they defy classification according to branch of Service.... In recognition of the need for single control in some of our most advanced development projects, the Secretary of Defense has already decided to concentrate into one organization all anti-missile and satellite technology undertaken by the DOD.⁹²

The administration clearly believed that the establishment of the ARPA was well within the broad powers of the Secretary granted under the National Security Act of 1947, as amended, permitting him to transfer, reassign, abolish, or consolidate noncombatant functions.

The Congress, however, claimed that the administration had

usurped a legislative function by directing the services without the attitude that the further congressional conference committee directed the Secretary of Defense on advanced research and development or one of the services for one year such designated. The committee to the ARPA, provided a new agency.

On February 7 the OSD announced its director, Mr. Robert McElroy, "within the DOD, certain advanced research and development in the nation's space program. The ARPA was authorized to work with other contractors, or to acquire facilities already established with only organization developing advanced research and development."

With ARPA established, the newly invigorated proposals from the services to avoid interservice rivalry.

Against stiff opposition, the OSD reviewed a number of pending decisions which were of primary responsibility for the authorization of the directive ordering three under Air Force ground-scanning satellites, highly classified, reconnaissance satellites. Major decisions of a million-pound thrust programs were not ordered for development, design and construction. Conflict concerning

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usurped a legislative function by altering the roles and missions of the services without its approval. Consequently, Congress adopted the attitude that the ARPA was largely a stopgap measure, pending further congressional consideration of space organization. The conference committee on the Supplemental Appropriations Bill directed the Secretary of Defense to engage in research and development on advanced weapons systems, either through the department or one of the services, and permitted the department to undertake for one year such nonmilitary space projects as the President designated. The committee, however, deleted all specific reference to the ARPA, providing at best a shaky legislative history for the new agency.

On February 7, ignoring service and congressional opposition, the OSD announced the formation of ARPA and the appointment of its director, Mr. Roy W. Johnson. The relevant directive⁹³ provided "within the DOD, an agency for the direction and performance of certain advanced Research and Development projects," including the nation's space research and the development of space weapons. ARPA was authorized to contract out research and development work with other agencies of the government and outside contractors, or to acquire such facilities as it might need. Thus the DOD had established what was on paper a powerful operating agency, the only organization in government with the explicit mission of developing advanced space projects.

With ARPA established, the OSD moved to add substance to the newly invigorated military space program. It requested proposals from the services for military space projects in an effort to avoid interservice rivalry.

Against stiff service opposition, Holaday and later ARPA reviewed a number of projects, although most decisions were postponed pending refinement of the organization. Among those decisions which were made in order to carry out the DOD's temporary responsibility for space programs were the November 8 authorization of the Army's Project Explorer and the March 23 directive ordering one or two lunar probes under Army auspices, three under Air Force direction, and the development of mechanical ground-scanning systems by the Navy. Military space projects were highly classified, but we know that one of these, the Air Force reconnaissance satellite Pied Piper, was funded during this period. Major decisions about the man-in-space program, the one-million-pound thrust engine, and weather and navigational satellite programs were not made, although relatively small investments were ordered for component development, preliminary engineering, and design work on these programs, pending final decisions.

Conflict concerning responsibility in the space field both

between the various services and ARPA and between the future civilian-military allocation of the space mission contributed to the relative inaction of the ARPA programmers.⁹⁴ Yet the level of support ARPA enjoyed was also the result of conscious policy choices in the OSD. John Finney, of *The New York Times*, one of the best-informed observers of ARPA's efforts during this early period, suggests that the "deliberate" pace of the agency's activities reflected the apathy toward space development permeating the highest echelons of the OSD and the administration. Although this relative inaction was in part due to unsettled organizational questions, it also reflects the priorities which DOD officials assigned to the space mission. While holding that the military establishment should be empowered to define those areas of space development which might contribute to the military mission, the OSD had to weigh military space efforts against more immediate claims upon the defense budget. The resultant assessment embodied in the military space budget for fiscal year 1959 indicated that the OSD was not pressing an urgent, top priority effort in the military exploitation of space.*

The OSD's effort to assert control over the total space program on a low-priority basis conflicted, of course, with the embryonic administration policy. Two days before the OSD established the ARPA, Eisenhower announced that the Killian Committee would investigate organizational alternatives for the nation's future space effort.

By implication the administration contradicted the OSD's reforms. As early as November McElroy suggested that the DOD take responsibility for developing the civilian uses of space if requested by a civilian agency to do so. "Our responsibility," the Secretary maintained, "on the civilian aspects of satellites involves whatever decision another agency of Government wishes to make in respect to using us. In that case we are glad to offer our services if we can be helpful but we do not consider that it is a responsibility of ours to initiate in that field."⁹⁵ He agreed that the government should pursue basic research and exploit civilian potentialities in the space field and that the National Science Foundation, AEC, and NACA all had responsibilities in the area. Since, however, the only capability for exploring space lay in the military, he conceived of a

* The FY 1959 budget request for ARPA was \$520 million, of which \$72 million were for nonmilitary lunar and scientific satellites to be later transferred to the civilian agency; \$310 million for an anti-missile missile system and for the Pied Piper; and the remaining \$138 million for all other space programs. These included projects that were both clearly military and those whose civilian or military nature was under discussion: the man-in-space program, the million-pound engine, weather and navigational satellites, satellite-tracking systems, instrumentation projects, the development of power sources. (See *Hearings on H. R. 11881*, p. 1164, and also *The New York Times*, May 25, Section IV, article by John Finney).

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During the month civilian space agency December 13 that the mission to control the upset the program he stated that it would ment outside the mission in this area without all this."⁹⁷ He argued produce civilian agencies as well, and thus persisted until the exploitation in a civilian OSD officials then however, was conditional ment's freedom to be restricted by any force

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civilian space program as one of collaboration between the military developer and the civilian user. The model uppermost in his mind was apparently that of the IGY, in which a civilian agency designed a scientific mission in space which the DOD performed. To implement this relationship his sole suggestion was that Killian should study "whether there cannot be some improved coordination of the research activities in these various parts of the Government, [since] I think that it is possible to make improvements."⁹⁶

During the months of policy hiatus, the DOD's opposition to a civilian space agency was almost axiomatic. Holaday testified on December 13 that the establishment of an independent civilian commission to control the satellite and space program would "radically upset the program in all areas." In response to further questioning, he stated that it would indeed be a "disaster" to place space development outside the military, since "you cannot do development work in this area without being related to and with the military people in all this."⁹⁷ He argued that all scientific aspects of space likely to produce civilian applications would be useful for military purposes as well, and thus properly belonged within ARPA. The OSD view persisted until the administration chose to place nonmilitary space exploitation in a civilian agency. As members of the administration, OSD officials then had to support this choice. Their support, however, was conditional upon the assurance that the military establishment's freedom to pursue its own interests in space would not be restricted by any formal commitment to overriding civilian control.

The Services

For each of the services, as for the OSD, the introduction of space into the military mission implied a possible change in its roles and missions. Each was involved in part of the embryonic space program; conversely, each would profit from benefits accruing from a military space program. The services provided not only the resources by which the DOD could exploit space, but also one of the strongest stimuli for this development. Moreover, in the period of policy-making from November until April, the services were peculiarly free to emphasize, in congressional hearings and through public media, their own particular space capabilities. Thus, with the initial spasm of reaction over, the services became independent political actors in the struggle for space.

THE NAVY The Navy was the least involved of the three services in the contest for space. It did not view space as a natural outgrowth of its mission, although it did express interest in exploiting certain navigational, communications, and meteorological aspects

of space. Furthermore, the Navy did have to carry on with Project Vanguard.

That project seemed rapidly to lose its charm for the service. After the first two Sputniks the Navy maintained a decorous posture, merely reiterating that the Vanguard was on schedule. This entailed four test-vehicle launchings, some of which might carry six-pound test satellites, between December and March, and six fully equipped twenty-pound scientific satellite launchings to fulfill IGY commitments by the end of December 1958. When the DOD announced authorization of Project Explorer to supplement the Vanguard on November 8, the Navy publicly welcomed the Army aboard the scientific venture. It continued to stress that neither Soviet nor Army competition would alter its plans. Unofficially, however, the Navy attempted to accelerate the program, indicating that, if initial tests were successful, a fully equipped satellite might be launched in January.⁹⁸ With the failure of the first test on December 6, in the full glare of national and international publicity, the Navy fell silent and concentrated upon keeping the project on schedule. Subsequent postponements and still another failure before the first successful test launch on March 17, in addition to the successful Army launching in January, downgraded the project still further. Indeed, the OSD seriously considered eliminating Vanguard and utilizing some of its components in Army and Air Force satellite vehicles.⁹⁹

Under the cloud of failure, the Navy continued to emphasize that Project Vanguard was a purely scientific endeavor unrelated to either naval capabilities for military research and development or to the Navy's mission. Garrison Norton, Assistant Secretary for Air, testified that the Navy was not a competitor with the other services for the production of space vehicles. Although the Navy had requirements in space, it had no desire to develop its own capabilities for these. On the other hand, it was willing to put its own research facilities at the disposal of whatever agency or service was designated by the OSD to develop a space capability, just as it had for the National Science Foundation and the National Academy of Sciences in Project Vanguard.¹⁰⁰

In general, the civilian Navy officials and the officers in the Pentagon discounted the military significance of space exploration. Secretary Norton warned in December against "Buck Rogers" thinking, terming the development of operational ballistic missiles the DOD's primary task and urging that nothing dilute this effort. These officials also resisted any reorganization of the space program within the DOD. Admiral Arleigh Burke, Chief of Naval Operations, stated flatly: "[I]t appears to me that this pressure toward reorganization is an illogical reaction to our not having an operational ballistic

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missile or satellite in the sky."¹⁰¹ Norton agreed, arguing that each service should have its own research and development organization with the DOD merely providing a monitoring organization to prevent duplication and facilitate communication between the services. In part, this skein of attitudes reflects the Navy's traditional fear of DOD centralization, which gravely threatens to limit the roles and missions of the service. Specifically, however, it reveals that the Navy, although relatively disinterested in space, preferred to retain its option to pursue this mission rather than to lose it irrevocably to a centralized agency or to one of the other services.

Navy research and development people, however, dissented from these views. Dr. John Hagen, Director of Project Vanguard, emphasized both the military and political significance of space, and recounted his dissatisfaction with the low priority placed upon the Vanguard. Hagen particularly stressed the need for scientific research in military development and complained that the DOD gave basic research virtually no priority.¹⁰² As far as organizational alternatives were concerned, he argued that

what is needed—and the precise location of the organization is perhaps debatable—is a single organization devoted to this type of work [space investigation and flight]. Whether that organization would be better placed in the DOD or whether it is better in a separate agency is the question to which I do not have the answer, but I know it would work within the DOD. There should be, however, this single agency into which policy decisions would be passed and then both the authority and the responsibility for action would be given to the agency.¹⁰³

This reflection of professional scientific rather than service bias introduces yet another set of particular interests and missions existing within the DOD. The research and development scientists, both civilian and military, shared many attitudes with their scientific colleagues and yet were among the most outspoken advocates within government for a high priority program of great magnitude in space exploitation. They were also to be the most sympathetic individuals within the DOD to the concept of a civilian space program.

THE ARMY In sharp contrast to the Navy, for the Army space exploitation was a matter of profound significance. Unequivocally, service spokesmen favored the establishment of a centralized military agency to conduct space research and development.

The reasons were not obscure. The Army had already proved that its research teams and facilities at the ABMA and the Jet Propulsion Laboratory were capable of undertaking advanced space

research projects. Yet the Army labored under a restrictive mission assignment in ballistic missiles. In an organizational shake-up the Army, specifically its research and development elements, was convinced that its teams could be preeminent in a military space effort. But, if space were to remain divided among the respective services, it seemed likely that the Air Force would assume an increasing portion of the mission. The immediate tasks as Army leaders defined them in the months after Sputnik were therefore to impress the DOD officials with the service's capability in space, and to support the establishment and decision-making powers of the ARPA.

Four days after the launching of Sputnik II, the Army received its chance to prove itself. McElroy authorized the launching of Jupiter-C test vehicles carrying an eighteen-pound Explorer scientific satellite to supplement Project Vanguard in the IGY. Determined to avoid an Army-Navy satellite race, however, the Secretary declared that the OSD would retain authority over the launching schedules of the two projects. Although the Army had sought the mission vigorously for three years, now it was apparently caught off guard. It was also disappointed because it was required to work within the framework of the IGY and therefore had only a limited satellite mission. Medaris and von Braun announced that the DOD directive failed to provide precise information about the number of satellites to be launched and the schedule to be met, and continued: "Until we are sure that we fully understand the participation that is expected of us we will have no comment."¹⁰⁴ Thereupon, the OSD directed the Army to proceed immediately with modifications of the guidance system for the Jupiter-C, ordered the Navy and National Science Foundation to provide the satellite instrumentation, and specified that the Army was to undertake two launchings, the first around February 1. At this point the Army plunged full speed ahead, convinced that it could beat the Navy in launching a full-scale satellite.¹⁰⁵

In Medaris' words:

I have language from the Army that says in good old-fashioned military terminology 'you vill on or about such and such a date do so and so'... the directive I now have is in words of one syllable and leaves nothing to the imagination. It just delights my soul.¹⁰⁶

He and his team were justifiably confident. The Jupiter-C, previously prepared as a satellite launching vehicle for Project Orbiter in 1956, was almost ready, requiring only a modification on the nose-cone and the addition of some minor components to return it to its original form as a satellite carrier. When the first Vanguard exploded

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At 10:48 P.M. on January 3, 1958, the Army's Explorer 1 and development team immediately issued abruptly, proved the "capability" of the team in the realm of outer space. Arthur G. Trudeau, then Secretary of the Army, mentioned the event, never let the people know we know what to do. The Explorer's home town was all over again. Fire engines and ten thousand soldiers carrying placards with "space is ours" and "we appeared in the convention." Azores had picked up whether he should come to have responded, "I

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Secretary Bruckner stressed the Army's strategic capabilities in space. It has a unique capability to this conquest of space. Notionally space exploration is the country's top priority. A development of a significant thing in the development of political and scientific concern was with the Russians did.

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on December 6, Army preparations speeded up. And on January 26, when the second Vanguard shot was postponed, the Army was officially authorized to make the next attempt.¹⁰⁷

At 10:48 P.M. on January 31, 1958, America's first earth satellite the Army's Explorer I, was launched into orbit. The research and development team under von Braun and ABMA officials immediately issued abrupt, forthright statements that the Explorer had proved the "capability of the Army's scientific and industrial team in the realm of outer space exploration."¹⁰⁸ Lieutenant General Arthur G. Trudeau, the new Army chief of research and development, mentioned the entire service in his boast: "The Army has never let the people down yet; . . . any time they give us the ball we know what to do with it."¹⁰⁹ On a more parochial level, the Explorer's home town of Huntsville celebrated New Year's Eve all over again. Fire engines and police cars unloosed their sirens and ten thousand shrieking citizens roamed through the streets, carrying placards with such messages as "move over Sputnik, space is ours" and "our missiles never miss."¹¹⁰ Only one breach appeared in the convivial spirit. After the tracking station in the Azores had picked up the satellite's signal, an aide asked Medaris whether he should contact Washington. The General is reported to have responded, "Not yet; let them sweat a little."

The Army's jubilation stemmed not only from the successful launch but also from the prospects it raised for the Army's subsequent role in space. All echelons expressed the opinion that the space mission was as important as any mission in the military establishment, if not more so. Given the restrictions upon the conventional manpower capability of the Army and the two-hundred-mile limitation placed upon missiles under Army operational control by Secretary Wilson in November 1956, space offered the Army a new lease on life. Hence its spokesmen's emphasis on the significance of space for military purposes was never divorced from outspoken assertion that Army teams were well qualified to go into space.

Secretary Brucker argued that it was imperative to demonstrate capabilities in the satellite field, adding that "the Army has a unique capability to make significant and early contributions to this conquest of space."¹¹¹ General Gavin flatly stated that unquestionably space exploration was "the most important thing confronting the country today."¹¹² He viewed the military satellite as a development of "tremendous significance, perhaps the most significant thing in our times,"¹¹³ and gave it higher priority than the development of ballistic missiles. Although emphasizing the political and scientific significance of space exploration, his major concern was with achieving military control of space before the Russians did.

You have got to get out there and get out there first and be able to sit down in international councils and determine as to who is going to be out there and who is to do what out there.¹¹⁴

In Gavin's view the control of space would dictate control of earth, and while he could not predict the changes space would introduce into the daily lives of human beings, he predicted "tremendous things will happen and we must get out there."¹¹⁵

Medaris echoed Gavin's view that military satellites should have greater priority than ballistic missiles by identifying the coupling between the two.

I feel that the priority should always be on the furthest thing out that you can conceive as a possibility. The priority today should be on the attainment of a space capability by the U.S. at the earliest possible date. Now you get all the ballistic missiles if you do that. They will come out just as an outfall of a properly developed forward-looking program that has as its aim the development of at the least parity, and hopefully control in the space area.¹¹⁶

In the same vein, von Braun outlined the nation's need for large, powerful single engines of at least one-million-pound thrust and for immediate financial support in the order of \$1 to 1.5 billion annually, if the country was to avoid the mortal danger of Russian space domination.¹¹⁷ Such a program, he predicted, would be the determinant factor in the military balance of power within fifteen years.

With their views on the significance of space underlined, Army spokesmen moved on to sketch the program and organizational arrangements best suited to the interests of their service. After Sputnik II the Army formally proposed to the OSD the immediate Army launching of several 200 to 300 pound reconnaissance satellites during 1958; development of more powerful rockets by the Army and Air Force, including initial work upon a single million-pound thrust engine; lunar, solar, and planetary probes; manned satellites, including lunar voyages; satellite developments in mapping, geodesy, meteorology, and communications, which would all offer civilian applications; the development of an anti-satellite capability; and work upon advanced propulsion techniques, including nuclear, ion, and photon power.¹¹⁸ In forwarding the program through Army and OSD channels, Medaris termed it a national rather than an Army plan, emphasizing that it sought to build from existing hardware in all services, avoid interference with ongoing weapons programs, and utilize whatever teams and facilities had proven capabilities in space research.¹¹⁹ Finally, Medaris depicted the Army as fully qualified to participate with other service research and development teams in such an effort.

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With such interests, it is not surprising that the Army gave strong support to the establishment of the ARPA. Brucker indicated that he preferred a centralized space mission within the OSD, adding that he sought no disagreement with the Air Force but that centralized direction could best utilize the capabilities distributed among the various services. Gavin, who argued strongly for a competent military staff directly responsible to the OSD, concurred. Medaris, the commander who would be directly under the supervision of such an agency, were it established, also favored a single decision maker (although he opposed an operational agency within the DOD which would remove the space mission from "experienced teams").

I believe sincerely that the best method for achieving it is that there must be someone responsible only to the Secretary of Defense; that is, right at his right hand, who is assigned by the Secretary and the President the power of decision in the things that were outlined in (the Army program) which do not exist, the authority to say yes, and the courage to do so, who through the medium of a very small staff can carry out the necessary job of assigning these projects, approving the total plan, assigning the resources, and monitoring the total competency to see that they do not fall backward.¹²⁰

Such an agency, in the minds of these Army officials, would properly protect the interests of their service. Yet while the Army sought centralized direction for the space mission, it was intent upon maintaining military control. Medaris reflected this Army position in his adamant opposition to an independent civilian space agency.

I believe that that individual [decision-maker] should properly be within the DOD, since otherwise you will have great collision of resources throughout the whole system by his being, by there being unfamiliarity with the current state of other things which affect the availability of resources and manpower in the different areas required to carry these things out, whereas, if he is working as a direct subordinate of the Secretary of Defense, he will normally and naturally be fully informed all the time with respect to the current status of other demands and will therefore place his requirements on people who are most able to carry them out.¹²¹

According to Army officials, a civilian agency divorced from the DOD would cause total confusion and seriously hinder the nation's venture into space.

As in the case of the Navy, however, service scientists differed from their military colleagues. Von Braun's proposal for a new space organization envisaged a broad, expensive national space program under what he termed a "national space agency" either in

the OSD or as an independent, civilian agency, and armed with both inhouse facilities and contracting authority. His major thrust was that "this kind of thing obviously does not belong in the Navy or the Air Force or the Army. It is a development of an entirely new technology. . . ." ¹²² He noted that at the moment the services were jockeying for position in the space contest and urged that no single one be permitted to gain control of such a crucial mission.

Although the elimination of service rivalries seemed his major concern, von Braun indicated that the scientists and the military differed in their views of the proper locus for the space mission. Hesitating initially to state his own choice, under Senator Johnson's close questioning he conceded that he ultimately would prefer to organize the space program in a way comparable to atomic energy. For the short run, however, he settled for assigning the space mission to the OSD with service research and development and missile capabilities utilized as that office chose. ¹²³

Thus the Army presented a coherent posture of favoring a broad military and scientific space effort under centralized direction by an agency within the OSD. Such a position favored the Army's participation in space, for, were one service to receive the mission, it seemed likely to be the Air Force. If the OSD were in charge of allocating space projects, however, Army leaders believed that its proved capabilities in scientific and military exploitation of space could secure a very respectable slice of the pie.

To a limited extent the DOD did permit the Army to exercise its space capability. In February it authorized a third Explorer shot and gave informal approval for two fifty-pound satellite launchings with the Jupiter-C rocket vehicle. In March it directed the Army to use these two satellites for lunar probes in the IGY program. And, according to Medaris, the OSD requested a firm schedule and budget proposal for Army space projects through December 1958. Medaris indicated that he anticipated the Army would "get the go-ahead on at least the first twelve months of this program." ¹²⁴

Yet at the same time there were indications that the Army would not win the long-range space mission it so avidly sought. In January, the retirement of Lieutenant General James M. Gavin, Army Chief of Research and Development, was an ominous sign that the service could not expect OSD support for the reorientation of service and military structures necessary to exploit a massive new program. Gavin indicated to the Senate Preparedness Subcommittee on January 6 that his vigorous advocacy of an urgent space effort hurt his chances for promotion. Implicitly he suggested that the DOD's evaluation of the Army's special space role and appropriate program was far from his own view. Announcing his resignation he explained:

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I don't want to defend next year's budget because I don't believe in next year's budget, the Research and Development budget, of the Department of the Army. I don't want to be put in the position of coming before Congress and saying that I approve of certain things that I don't.¹²⁵

Confirming Gavin's fears, John Finney of *The New York Times* reported on March 6 that authorities within the OSD were predicting that though scientific or "prestige" assignments would still be made to the Army, the Air Force would be charged with developing military applications of outer space.¹²⁶ McElroy, according to Finney, considered space exploitation consistent with the Air Force's overall function. Such an assignment was precisely the opposite of the Army's goals.

THE AIR FORCE The Air Force position stemmed from an earlier allocation of missile responsibilities. The Air Force had operational control over much of America's potential booster capability: the Thor IRBM, and the Atlas, Titan, and Minuteman ICBMs. Moreover, it had been working in space research since the end of the World War II. This program was almost entirely military, and hence classified, but throughout the months after Sputnik, ongoing projects received enough public attention to indicate that the Air Force was more deeply involved in military exploitation of space than any other service. Buttressing these advantages was the service's claim that the space mission was a natural outgrowth of its military responsibility in the earth's atmosphere. Accordingly, the Air Force saw its interest to be that of resisting, or at least downgrading, the centralization of the space mission within the OSD. Its rule of thumb was that the less control granted to the OSD, the greater the portion of the space mission that might fall to the Air Force.

The Air Force's evaluation rested on an interpretation of space exploitation as a natural extension of the ballistic missile program. Although ardently contending for the space mission, the Air Force sought above all to protect the status of its ongoing aircraft and ballistic-missile programs. Hence, top officials in the service, like officials in the OSD, concentrated on the need to maintain control of the air with ballistic missiles. Under pressure, Secretary Douglas stressed that space developments and ballistic missiles should be given equal priority, but added: "I would like to leave the priority with the ballistic missile program to the extent that the two might conflict."¹²⁷ Similarly, Richard E. Horner, Assistant Secretary for Research and Development, argued it would be "utter folly to reduce the sense of urgency on the ballistic missile program at this time"¹²⁸ and agreed with Douglas that, if ballistic missiles and space operations were competing for resources, the missiles should

be given top priority. Such competition could, of course, be avoided if the pace of both missions were determined concomitantly by the Air Force.

Only General Bernard Schriever, Commander of the Air Force Ballistic Missile Agency, specifically stated that in long-run terms, national security would depend upon space superiority.¹²⁹ Yet he, too, argued consistently that 90 percent of the developments in the missile program could be applied to space and that the two must move together.

The entire astronautical development program which I have touched upon can be initiated at once, with no dilution in diversion of our ballistic missile programs. As I analyze the future, if we are to meet the challenging requirements of either ballistic missile acceleration or of astronautics, we must recognize where our strongest capabilities lie today and make certain decisions now.¹³⁰

In short, all the Air Force witnesses who testified before the Preparedness Subcommittee argued that space was important, even crucial, but not so important as to divert resources from ongoing missions. Hence, Air Force spokesmen did not argue, as the Army had, that space was the most significant arena of potential military activity. Instead, they evaluated the significance of space for national security and sought to pace space exploitation in terms of the development of Air Force roles and missions.

The Air Force had a strong case, both logically and empirically. Its ballistic-missile capability provided a fine basis upon which to build an astronautics program, and Air Force officials constantly repeated this refrain. General Schriever argued that "our present studies have shown that by using our presently existing rocket engines and missiles, we can provide both at the earliest date and at the greatest economy, not only unmanned reconnaissance of the moon, but also a basic vehicle for manned space flight."¹³¹ Indeed, he stated that current Atlas, Titan, and Thor programs would provide booster capacity for all the space missions of interest to the DOD for the next ten years. Moreover, the Air Force had ongoing space programs in a broad range of fields. It had engaged in high altitude research to study cosmic rays, thermal characteristics and effects upon human beings launched in balloons. The School of Aviation Medicine at Randolph Air Force Base had been investigating medical aspects of outer space, and research and development groups in the AFBMA had been working on guidance and propulsion problems of space flight. Air Force witnesses argued that this comprised a broad, comprehensive program in which the service was making real progress.

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Specifically, two Air Force space projects were in the final stages of development in the early months of 1958. The X-15 research aircraft, developed with NACA cooperation, was scheduled to fly in early 1959. If successful, this model would permit man to fly at speeds above one mile per second and at altitudes above one hundred miles, at the boundaries of outer space.¹³² Hence the aircraft presented many of the reentry problems confronting manned satellite flight. Second, the 117-L reconnaissance satellite, or *Pied Piper*, was closer to operational deployment than any other military satellite program. The OSD had authorized the Air Force to move into the systems development stage shortly before *Sputnik I* and subsequently accelerated the program.¹³³ The Air Force hoped to launch a test vehicle by October 1958 and to launch the first actual satellite by spring 1959. The test vehicle, incorporating certain components of the final satellite, would use the Thor booster; the satellite itself would eventually utilize the Atlas, thereby gaining a significantly heavier payload.¹³⁴ Both programs called attention to the Air Force's capability for scientific and military exploitation of outer space, and the service used them to bolster its claim for operational responsibility in this field.

Organizationally as well, the Air Force undertook to preempt the space mission. On December 10 it established a short-lived Directorate of Astronautics with Brigadier General Homer Boushey, Deputy Chief of Staff for Research,¹³⁵ as its director. According to the Air Force, the new directorate would be an internal management organization to pursue and coordinate advanced research projects within the service under the overall guidance of ARPA. As indicated earlier, the OSD interpreted this move as a clear Air Force attempt to establish hegemony in the military space program and to undermine the ARPA. But the announcement of these plans by Donald Putt, Deputy Chief of Staff for Development, was a measure of the enthusiasm with which Air Force officers, particularly those in research and development, viewed the space mission as an extension of service responsibilities.

Like the Army, the Air Force presented a plan for future space exploration to the OSD which would further the service's long-run interest in space. Unlike the Army's national plan, however, the Air Force offered proposals which were primarily to be executed by Air Force facilities. The most significant divergence from the Army's plan was the Air Force's disbelief in the necessity of developing a single, million-pound thrust engine. The Air Force preferred to rely on combinations of its existing rocketry.¹³⁶

General Thomas D. White, Chairman of the Joint Chiefs of Staff and Lieutenant General Clarence S. Irvine, Air Force Deputy Chief of Staff for Materiel, had predicted already that the next war would

be fought by space weapon systems.¹³⁷ The Air Force space plan now reflected this prediction by providing an evolutionary shift from present ballistic missiles to future space weaponry. The present Thor booster, with second-stage hardware from the Vanguard, could reputedly lift 3000 pounds into orbit by late 1958.¹³⁸ With additional third-stage hardware, the Thor could undertake unmanned reconnaissance of the moon, impacting a small instrumented package upon it by the end of 1959. A slightly modified Thor with a high-energy fueled upper stage already under development could put a larger payload in orbit, make initial unmanned reconnaissance of Mars and Venus, or send an instrumented recoverable package around the moon. Later the Atlas could make soft lunar landings, and the Titan, with high-energy second and third stages, could put even greater weights into orbit, support extended manned satellite missions, deliver larger payloads to Mars and Venus, or launch manned circumlunar flights. In addition to building the required booster capacity for these programs, the Air Force emphasized that it was currently working on the guidance systems, payloads, and manned experiments to be used in the projects. "In other words," Schriever concluded, "we are not just groping around. We can actually specify things."¹³⁹

It was obvious, however, that what they had specified was a program to be undertaken primarily by the Air Force. To men like General White, this was utterly logical, since the Air Force was "synonymous with air warfare" and space was merely a natural extension of air.¹⁴⁰ Hence, contrary to its typical support for greater centralization within the DOD, the Air Force was bitterly opposed to the establishment of ARPA. In the words of General Irvine:

What we don't need down in Washington is more commissions, more czars and more organizations. We have a President, a Congress, an Administration, and a Secretary of Defense. I said and I say again, we don't need any more czars or any more institutions. We need decisions by the Secretary of Defense and we need less people in the OSD. We need the delegation to the three military departments of the jobs that belong to them, and somebody with guts enough to hit them over the head if they don't do it that way.¹⁴¹

The chief impediment to progress in space, according to all Air Force witnesses, lay in separating research and development of weapons systems from their military user. In General White's words, "I would naturally prefer to have it (space) in the Air Force because I think we have done more in that respect than anybody else, by a very great margin, and naturally I would like to go on with it." Believing that space was within its mission, the service

was therefore deterred in its own laboratory.

So, in addition to disparaging the concept of the OSD, Schriever and the astronautics management capabilities already in the programs at a cost in excess of these programs." that he did support

If that is the way we are made to set up the Pentagon, the technical development of the good thing. The point to the point where they would set up a kind of an agency up.¹⁴⁴

But a low-powered agency was its preferred choice. The establishment of the agency develops these three ducts should be cut off. Added, the Air Force ducts, since it utilizes missions, and in the future. Once assured of no exploitation, the Air Force graded ARPA. Undoubtedly depended on a narrow agency ought to be respectful of the Air Force's role and its mission.

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was therefore determined to keep space research and development in its own laboratories.¹⁴²

So, in addition to pressing its own claims in space, the Air Force disparaged the concept of a strong operational space agency within the OSD. Schriever argued that "any program to establish a separate astronautics management agency would result in duplication of capabilities already existing in the Air Force ballistic missile programs at a cost in funds and time similar to that already expended on these programs."¹⁴³ Schriever admitted under close questioning that he did support a central decision-making agency.

If that is the way it is set up, I am all 100% for it. But if attempts are made to set up a procurement staff and do the contracting out of the Pentagon and set up a big technical staff there and make all the technical decisions, I say you are not going to set up a very good thing. The draft of ARPA that I have seen to date . . . does go to the point where they would set up their own labs, perhaps; they would set up their own procurement organization. This kind of an agency is what I am against. Now they may set it up.¹⁴⁴

But a low-powered ARPA was only acceptable to the Air Force, not its preferred choice. White indicated a willingness to go along with the establishment of the ARPA with the proviso that "no matter who develops these things, the service that is going to use the end products should be cut in from the beginning."¹⁴⁵ And, he immediately added, the Air Force would be the primary user of such end products, since it utilized "everything that fits into our roles and missions, and in my opinion, almost everything in space does."¹⁴⁶ Once assured of major operating responsibility for military space exploitation, the Air Force came to accept the existence of a downgraded ARPA. Unlike the Army, the Air Force's future in space depended on a narrow definition of ARPA's functions. In its view, the agency ought to be limited to high-level decision-making, duly respectful of the Air Force's responsibility and capability for pursuing its roles and missions out into space.

Thus each of the services added its own evaluation of the space effort and organization which the DOD should adopt to that of the OSD. By the end of March, however, problems raised by the ambiguous powers of ARPA were further complicated by the President's advocacy of a civilian space agency to share responsibility with ARPA for the exploitation of space. The attitudes which the OSD and the individual services took toward the proposed NASA were derived from those which they had adopted toward the ARPA. Their new strategies, however, were more similar than the earlier ones. While disagreeing among themselves as to the organizational

and budgetary support necessary for military exploitation of space, they were at least agreed upon the need for exploitation by the military establishment. Confronted with a civilian challenge to their freedom to determine what programs were to be considered militarily significant, the services closed ranks with the OSD. As the stalwart defender of the popular faith of national security, the military establishment used its substantial resources of power and influence to meet head on other political actors who doubted either the wisdom or the utility of turning space over to the generals.

The Scientists

Sputnik both popularized and politicized science in America. The political generalists responsible for national policy-making had recognized in the scientific specialists the technical skills necessary to meet the current crisis and had called upon them to be the "saviors" of the nation. The scientists responded with uncertainty and ambivalence, and, unlike other political activists, remained essentially unsure of their strategy in space policy-making throughout the subsequent months. This conflict arose, in essence, because the scientists continued to be uncertain of their objectives even while their new political influence was on the rise.

Three important attributes characterize the scientists' political behavior throughout the months of policy hiatus. First, they were entering the political arena as only newly prestigious and relatively inexperienced participants. Second, they faced many unresolved questions in their relations with the federal government that they considered more fundamental than space. And, last, in contrast to their own view of the Sputnik crisis as a vehicle for the overall reconstruction of scientific relationships with government, their political hosts expected them to engage actively in policy-making for space. While these characteristics were common to the entire scientific community, as months passed shades of difference and of emphasis emerged among the scientists outside and within the federal government. These differences in turn did contribute to the policy product.

THE NONGOVERNMENTAL SCIENTISTS The scientists outside of government felt these pressures most acutely. During the period from November until April they displayed little urgent concern with the national space effort. This relative disengagement from the issue had two roots: the traditional insulation of the community from the political arena, only slowly modifying after Sputnik, and greater interest in other public policy issues concerning science. For these reasons the scientific com-

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munity outside government made for immediate exploitation to offer specific recommendations.

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munity outside government assigned a relatively low priority to the immediate exploitation of space and displayed a marked reluctance to offer specific recommendations upon the organization of the space effort.

The first cause of the scientists' disassociation from policy-making for space lay in their reluctance to see science politicized. The weekly journal *Science* set the tone for most scientific journals when it editorialized in late November:

Current emphasis on science in the thinking of... public leaders illustrates both a good trend and a bad habit. To have greater attention given to the welfare of science is good, but to have attitudes change so quickly and radically is a part of the inconsistent, on and off support that interferes seriously with steady scientific progress.¹⁴⁷

In short, the scientists feared that the political weight attributed to space might drive the country into programs more massive than what they might consider professionally warranted.

Second, the scientists were more interested in other national scientific efforts than they were in space. The public statements of civilian, nongovernmental scientists in the months after Sputnik give a composite picture of this interest.¹⁴⁸ All expressed the basic conviction that the status of science and technology was a measure of social progress in the modern world; urged America to recognize Soviet scientific achievements; reiterated the crucial need for scientific breakthroughs and risk-taking if America were to gain in the cold war; and finally, entered a plea for American society to upgrade the status of the scientist. To these ends they urged basic reforms along a variety of fronts. They called for federal support of the educational system, both to make it more challenging in general and to increase the amount of scientific instruction in particular. They sought increased government support for basic research; greater recognition by the federal government of the scientific input in weapons development; better organization of military research and development programs; and greater mobilization of the nation's scientific capabilities for the national security effort. They recommended better working conditions for scientists in federally supported projects or government agencies, including more translation facilities, less restrictive contracting procedures, freer exchange of information with other scientists, and less stringent security measures.¹⁴⁹

On these broad issues, the voices of the scientific community were loud and strong. There was, however, only passing reference to space and markedly little precise opinion in the public record concerning either the significance or the potential organization of

the space effort—with the exception of a few proposals by particularly space-oriented scientific fraternities or organizations. When these did appear, furthermore, they supported the IGY view that the space effort should be directed toward what might be scientifically valuable.

In testimony before the Senate Preparedness Subcommittee, the star scientific attractions, Dr. Edward Teller and Dr. Vannevar Bush only mentioned in passing that space should be a specific arena of activity in an expanded scientific effort.¹⁵⁰ In two public speeches in January and February 1958, Dr. Isidor Rabi, the chairman of PSAC, while referring to the satellites as “an accomplishment... of utility,”¹⁵¹ urged America not to allay its sense of urgency in general scientific progress because of the successful Explorer flight.¹⁵² In discussing the organization of the scientific effort, various scientists such as Dr. Arthur Compton and Dr. Lee duBridge praised the Killian appointment, but did not assign him any particular role in organizing the space effort.¹⁵³ The major general scientific association to meet in the months following Sputnik II, the American Association for the Advancement of Science, made no mention of a space program in the report of its Parliament of Science, although most of its discussion was devoted to “science and public policy.”¹⁵⁴

In facing the specific problem of designing the nation's future space effort, proposals predominantly sprang from space-oriented professional organizations. There were five such public, unsolicited proposals for the organization and exploitation of space. These statements included a proposal for an Astronautics Research and Development Agency to control outer space development, presented to the president by the American Rocket Society on October 14, 1957; a petition in *The New York Times* on November 7 from the editors of *Missiles and Rockets* suggesting a National Advisory Committee on Astronautics; a proposal for the organization of a National Space Establishment submitted to Dr. Killian on November 21 by the Rocket and Satellite Research Panel of the National Academy of Sciences; a joint summary proposal of the American Rocket Society and Rocket and Satellite Research Panel issued on January 4, 1958; a statement by the National Society of Professional Engineers on February 13, recommending the establishment of a federal Space Exploration Commission; and finally, a statement by the Council of the Federation of American Scientists suggesting control of outer space by the AEC along the lines of a bill, S. 3117, currently sponsored by Senator Clinton Anderson.¹⁵⁵ Although varied in scope and organizational detail, each of these proposals suggested an independent, federal space agency or commission outside the DOD using either the NACA or the AEC as organizational models.

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Both the American Research Panel had in 1944, and their combined Academy of Science of these markedly so that it is imperative and technical leader human progress and national space flight ment to undertake that would be “to unify space research and specifically excluding operations in space of the DOD.”¹⁵⁷ It National Space Establishment independent agency toward broad culture [which] transcend the rocket missions of that would not have defeated DOD facilities and the mission of the NSE be set up “in such a three services... Such the NSE is an independent responsible only to that with the clear prospect date.”¹⁵⁸

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Both the American Rocket Society and the Rocket and Satellite Research Panel had initiated work on their proposals before October 4, and their combined proposal, supported as well by the National Academy of Science, is perhaps the most authoritative and specific of these markedly similar proposals. It argued "on the assumption that it is imperative that the U.S. establish and maintain scientific and technical leadership in outer space research in the interests of human progress and national survival," that there be created a national space flight program and a unified national space establishment to undertake the scientific exploration of space.¹⁵⁶ Its functions would be "to unify and greatly expand the national effort in outer space research and in the practical utilization of space capabilities specifically excluding space weapon development and military operations in space which are considered to be the responsibility of the DOD."¹⁵⁷ It was considered "strongly desirable that the National Space Establishment be given statutory status as an independent agency in order that its work... be freely directed toward broad cultural, scientific, and commercial objectives... [which] transcend the short-term, though vitally important military rocket missions of the DOD." The drafters emphasized that the NSE would not have defense missions, and that in the immediate future, DOD facilities and missile technology would be required to execute the mission of the NSE. It was specifically mentioned that the NSE be set up "in such a way that it enjoys the unqualified support of all three services... Such a situation is believed to be possible only if the NSE is an independent agency from the outset—or if it is directly responsible only to the Secretary of Defense during its early years—with the clear prospect of independence at the earliest possible date."¹⁵⁸

Thereafter, the proposal listed a timetable of space projects to be pursued in the subsequent decade, and outlined relatively explicitly the distinction between the missions of the NSE and the DOD in space. The only reference to future coordination between the two agencies was that there should be "clear channels for mutual cooperation... in order to assure no jeopardy of short-term, vital military need on the one hand, and in order to assure maximum rate of advance of space research on the other."¹⁵⁹ Finally, the proposal concluded with emphasis upon the potential educational, cultural, and intellectual contribution of space research to the United States and the world. Space was depicted as an "endless frontier," offering meteorological, agricultural, communications, commercial, navigational, medical, and biological aids to man's life. Many would be of military value, but the sponsors argued that "their greater value [would] be to the civilian community at large."¹⁶⁰ "To use a homely example," it concluded, "the telephone is certainly a valuable

military device, but its importance to the civilian population is vastly greater."

This proposal seems based upon two major assumptions: that the peaceful, civilian exploitation of space was of greater ultimate significance than military operations in the same area; and that military uses of outer space could be demarcated with relative clarity, thereby permitting streamlined civil-military liaison. The scientists definitely envisaged the NSE as the single agency in charge of overall planning and basic research for the national space effort, as well as being responsible for the development and operation of civilian missions in space.¹⁶¹ On the other hand, the military was to develop space vehicles only for specific military requirements that would be proved feasible by the prior research efforts of the NSE. The proposal urged effective liaison between the military and the civilian agencies but offered no specific suggestions as to how this should be accomplished. By implication, a correct division of military and civilian functions in space would be based upon agreements between military and civilian scientists concerning what constituted military requirements.

This proposal had widespread support from the nongovernmental scientists who were interested in space. Of the thirteen scientists who specifically submitted their views on the organization of space to the Preparedness Subcommittee, ten of these either explicitly supported the NSE proposal or recommended that aspects of the missile as well as the space program be placed under such civilian control.¹⁶² Nine of these ten, not surprisingly, were members of the Rocket and Satellite Research Panel.* The other three, Dr. Clark Millikan, George H. Clement, and Simon Ramo—all closely connected with the Air Force—recommended vesting control of space in a central organization within the DOD, or in one of the services, presumably the Air Force.

A second specific proposal on space came from the IGY. On February 14, 1958, the Technical Panel on the Earth Satellite program of the U.S. National Committee for the IGY submitted to the administration a plan for future American space efforts entitled "Basic Objectives of a Continuing Program of Scientific Research in Outer Space."¹⁶³ It focused exclusively upon the scientific returns to accrue from outer space and stressed the scientific dimension of space as the basic motivation for exploring this new frontier.

The IGY marks the beginning of man's exploration of outer space. . . . The interests of human progress and our national wel-

*Among them Drs. William G. Dow, Krafft Ehrlicke, Leslie M. Jones, W. W. Kellogg, Myron H. Nicols, Marcus D. O'Day, William H. Pickering, N. W. Spender, and J. H. Allen.

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fare now demand that a long-term program of space exploration be formulated and pursued by the U.S. with the utmost energy. Although there will inevitably be benefits from such a program of a very practical nature, *the basic goal must be the quest of knowledge about our solar system and the universe beyond.*¹⁶⁴

The proposal suggested future projects in the fields of sounding rockets, earth satellites, lightweight satellite experiments, advanced satellite developments, lunar investigations, planetary and interplanetary investigations, and finally manned space flight. This effort was to be supported with due awareness that space technology would develop gradually; that initial payloads, distances, and scientific observations would be modest; and that manned space flight would be in the relatively distant future since it could "not now be very clearly justified on purely rational grounds."¹⁶⁵

As participants in an unofficial, apolitical, international scientific alliance and common effort, the IGY Committee was perhaps obliged to discount the political repercussions of the space race—indeed, to discount the very existence of such a race. Yet more general principles were evident in its proposal. First—and most basically—scientific value judgments were to determine whether space projects rather than other scientific endeavors would be undertaken. Second, within the space program itself the maximization of scientific achievement would serve as the basis for selecting among possible projects. No other considerations were explicitly introduced as criteria for initiating either a space program or any specific project. And throughout the proposal there is no reference whatsoever to military uses of space, prestige purposes of space exploitation, or any specific treatment of commercial or civilian advantages to be gained from space exploration. This IGY model represented in the extreme the shared emphasis of the private scientific community upon the scientific nature of space exploration, rather than its political or military aspects.¹⁶⁶

THE GOVERNMENT SCIENTISTS Like the scientific community at large, the great majority of government-employed scientists and those working in close advisory capacities, ranked space exploitation below other scientific activities and urged broad civilian control of whatever space effort was undertaken. The most notable dissenters from the assignment of a low priority to space were some, but by no means all, scientists in military employ and the German rocket scientists, whose zeal for space exploration had remained constant under Hitler, Truman, and Eisenhower alike. In general, however, these government officials, both out of professional bias and need to protect the overall scientific mission of the government, downgraded the space mission and attempted to dissuade other

political actors within government from precipitating a crash program in space.

In the first few months of his tenancy in the White House, Dr. Killian made no specific public references to the space program. His mission was, in the short run, to unscramble the missile program, and in the longer run to "help the President follow through on the program of scientific improvement of our defenses" and to encourage proper government support for science and technology.¹⁶⁷ As the job evolved, his duties included overseeing various scientific panels of the PSAC, and presiding over a scientific board of review for planning decisions confronting the President.¹⁶⁸ Killian and the PSAC were to advise upon, coordinate, and expedite "problems of national policy involving science and technology" which ranged over a spectrum from federal support of scientific education to organization of military research and development policies. Charged with the task of presenting to the government the overall interests of science, space was only one of their major concerns.

Of the government scientists outside the White House, those within the military services were, not unnaturally, the most concerned with the space program. These men presented an interesting combination of service and military loyalties and professional scientific commitments in viewing the significance of the space effort and its potential organizational structure. In the cases of eleven scientists employed by the military services who answered specific questions before the Preparedness Subcommittee about possible organization of space, all favored centralized research and development efforts perceptibly more than the military spokesmen of their respective services.¹⁶⁹ Predictably, however, the Air Force scientists were less enthusiastic about centralized direction of the space effort than were scientists in the other services.

Like other members of the DOD, these eleven military scientists stressed the need to integrate scientific and military exploitation of space. They repeatedly cited Project Vanguard as an example of inefficient use of resources, stemming from an arbitrary divorce of military and scientific missions. At the same time, however, six of them argued that scientific exploitation of space was an urgent and necessary mission of government that would be best organized within the civilian branch of the government along the lines of the Rocket and Satellite Research Panel's proposal. Two of the six believed that such an organization should be first established within the DOD and later moved out into an independent agency, an alternative considered in the Rocket and Satellite Research Panel proposal and also supported by Drs. Hagen and von Braun.¹⁷⁰ In either case it seems that the scientists within the military establishment—more clearly than almost any other specialist group concerned

with space—foresaw a program which would structure a distinct military approach.

Among the civilian scientists, the NACA all professed that some elements within the Commission were important in future space and the NSF was more concerned with the status of science within the government than with acquiring space as a major government activity, as to how a space program should be organized. The NACA was more concerned with the space program from the space program's inter-related research and planning for several years, purely aeronautical research for organizational and by public administration of its own capabilities for space.

On November 1, 1958, the NACA, announced the Space Technology Committee's chairmanship of the Engineering at the National Academy of Sciences began in earnest the subject of space, the broad original authority in all its aspects thereby including the development of vehicles as well as research since the committee was stressing that "the research and development of interplanetary flight the national space program efficiently implemented the NACA, the National Academy of Sciences proposal vested the authority of military mission authorized NACA of additional value in space; and given research priorities

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with space—foresaw the necessity for an organizational solution which would structure space around interdependent but still distinct military and scientific missions.

Among the civilian agencies of government the AEC, NSF, and the NACA all professed interest in space. Immediately after Sputnik, some elements within the AEC considered that space might fall within the Commission's province since nuclear energy would be important in future rocket propulsion. In general, however, the AEC and the NSF were more concerned with the enhanced overall status of science within government, from which they would profit, than with acquiring the new space mission. They neither argued for a major government program in space nor publicly expressed views as to how a space program might be organized within the executive branch. The NACA, however, did see new agency programs arising from the space mission. The aerospace concept of a continuum of inter-related research had been operative in the Committee's planning for several years. At the point of diminishing returns in purely aeronautical research, NACA needed an expanded mission for organizational survival. Thus, through internal reorganization and by public advertisement, the committee sought to promote its own capabilities for the government's space effort.

On November 12 General James H. Doolittle, the chairman of NACA, announced the creation of a new Special Committee on Space Technology within NACA. With the appointment of this committee's chairman, Dr. H. Guyford Stever, Associate Dean of Engineering at MIT, on January 12, NACA's promotional campaign began in earnest. On January 16 NACA adopted a resolution "on the subject of space flight," asserting that NACA had within its broad original authority "investigation of problems *relating to flight in all its aspects outside of or within the earth's atmosphere*," thereby including missiles, satellites, and outer space projectiles and vehicles as well as aircraft.¹⁷¹ After outlining its work in space research since 1945, including the X-15 research airplane, and stressing that "the urgency of an adequate national program of research and development leading to manned satellites, lunar and interplanetary flight is now apparent," the resolution proposed that the national space effort could be "most rapidly, effectively, and efficiently implemented by the cooperative effort of the DOD, the NACA, the National Academy of Sciences, and the NSF."¹⁷² The proposal vested research, development, and operational control of military missiles, satellites, and space vehicles in the DOD; authorized NACA to develop technical devices and conduct flights of additional vehicles and other operations for scientific research in space; and granted overall planning functions and assessment of research priorities to the NAS and the NSF.

On January 26 Dr. Hugh Dryden, the Director of NACA, expanded upon this proposal in a policy statement before the Institute for Aeronautical Sciences. After citing the alternative proposals for space organization, both civilian and military, he concluded:

There is another solution to the problem of how best to administer the national space technology program, one which clearly recognizes the essential duality of our goals—the prompt and full exploitation of the potentials of flight into space for both scientific and military purposes. Actually this solution is old and well-tested. It is explicitly stated in the 1915 legislation that established the NACA with responsibility to “supervise and direct a scientific study of the problems of flight, with a view to their practical solution”.... The Committee structure of the NACA embraces both the non-military and the military elements of aeronautics. The research of the NACA [is] designed to be useful to both the non-military and the military segments of aeronautics. The entire operation of the NACA is based upon the premise that coordinated teamwork effort by all parties concerned provides the surest guarantee of progress in aeronautics.”¹⁷³

If Dryden viewed NACA as eminently suited for the new space mission, he still believed that a major revamping of the agency was in order. He stressed the need for new research facilities, a larger staff, and expanded contracting authority. And, based upon years of experience in doing work with military services in aeronautics, he also was impressed with the need for military exploitation of space. The NACA proposal thus approached the position of civilian scientists in the military establishment in its recognition of the dualism involved in any space effort and its conviction that the military program should be well coordinated with the civilian. It also offered many of the features which the nongovernment scientists had valued in their various proposals: broad civilian control of the space effort, and an established channel through which scientific criteria could be used in determining the amount of resources allocated to space. As such, NACA was an obvious nucleus for a new space agency.

The Congress

Like the administration, the Congress had a general responsibility for space policy. Within Congress, as within the executive branch, certain key partisan groups, committees, and individuals chose to view space policy from particular perspectives, aligning themselves with similar-minded elements within the executive branch or among the public. These coalitions emerged during the

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period of space policy. The shared interest in space was the shared interest in space.

Nonetheless, institutional interests in space were different. Congress convened a congressional committee on space, which emerged, different from the limited aims of the executive branch, directly on many issues. It shared in a process of building not typical of the executive branch.

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and a general responsibility within the executive branch; and individuals from various perspectives, aligning themselves within the executive branch emerged during the

period of space policy hiatus with special strategies evolving out of the shared interests of the coalition members.

Nonetheless, in its general role Congress displayed a greater institutional interest in the establishment of NASA than the modern Congress conventionally reveals in policy initiation. As time passed, a congressional, as distinct from an administration, policy for space emerged, different in philosophy and tone, which overrode the more limited aims of the internal cliques and confronted the executive directly on many points. All major congressional leaders came to share in a process of heightened deliberation and creative program-building not typically found in contemporary legislating.

PRESESSION SPACE POLITICS The initial efforts at semi-independent congressional policy-making occurred shortly after Sputnik II. The moderate Democrats led by Johnson and Rayburn, although lacking a comprehensive legislative program of their own, saw themselves as the protectors of national security. Believing the administration slow and cautious, they were prepared upon almost any aspect of the space issue to go beyond the administration proposal.

While the administration worked on its legislative proposal, Johnson gradually built a congressional coalition both willing and able to engage in at least quasi-independent policy-making. To do so, Johnson fought a determined battle against the partisan Democrats' strategy of unrestrained criticism and sought instead to push the administration into greater action.¹⁷⁴ The two Texans' major point was that the country lacked leadership and that the Democrats would provide it, whether or not the administration went along.¹⁷⁵ It was this theme that dominated the conduct of the Preparedness Subcommittee hearings and motivated Johnson's frequent proposals for improving the nation's national security posture. By concentrating upon such a forward-looking strategy, Johnson alternatively ignored and disparaged the arrant partisanship of both liberal Democrats and conservative Republicans. Although unable to divest the space issue of all partisan overtones, it was he more than anyone else in government who raised the space issue to a level of truly national debate, a level at which the Eisenhower administration remained implicitly, if not explicitly, on the defensive.

By contrast, the more moderate Republicans and Republicans interested in military affairs took the tack that the entire country must support Eisenhower in a national program to meet the Soviet challenge in space. This strategy, however, was complementary to that of the moderate Democrats: it required both prodding the administration into more decisive action and cooperation with the Johnson-Rayburn branch of the Democratic party in Congress. Like Nixon,

this group called for a bipartisan review of defense policy, expressing concern with the rate of scientific and technological progress and emphasizing the need for coordination in the satellite and missile programs. Senator Styles Bridges, emerging as the major spokesman for this group, voiced the opinion that Congress would appropriate whatever was necessary for the defense effort, and that missiles and satellites deserved the highest priority effort the government could provide.¹⁷⁶

Thus both their congressional and partisan roles impelled these Republicans to take their critical stance. When the strategy of the moderate Democrats emerged as the dominant strategy of the session, it was in the interest of moderate Republicans to go along in order to limit as much as possible the freedom with which Johnson could appear as the defender of national security.

This coalition chose the Preparedness Subcommittee Hearings as the specific instrument by which Congress initially joined the space policy-making process. The "Inquiry into Missiles and Satellites" was itself a broad examination of the defense posture of the United States, not directly focused upon the space program. Yet in reviewing past and ongoing space projects, the Preparedness Subcommittee (hereinafter referred to as the committee) came to certain conclusions that would later enjoy broad congressional support and that had important impact on the organization and magnitude of the future program. The issues on which the committee concentrated its criticisms of the then-current administration program became guidelines for the emerging congressional position.

From the outset, the committee fulfilled its constitutional function as overseer of the administration, with stress upon institutional rather than partisan criticism. "It is," Johnson explained, "not important what kind of a record we make for an election if circumstances are such that we do not have any more elections. That could easily happen if we spend our time eating each other up."¹⁷⁷ Throughout the proceedings Chairman Johnson sought and eventually attained unanimous findings to comprise a truly bipartisan report in the face of what the committee considered a genuine national peril.

United in this evaluation, the members were determined to "find the facts and see what the Senate can do to help out."¹⁷⁸ Johnson's opening statement on November 25 set the tone of the deliberations:

Our country is disturbed over the tremendous military and scientific achievements of Russia. Our people have believed that in the field of scientific weapons and in technology and science that we were well ahead of Russia . . . It would appear we have slipped dangerously behind . . . in some very important fields. But the Committee is not rendering any final judgments

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Given its oversight function, pessimism characterized the committee's basic assumptions. Questions and comments in open testimony indicate the Senators believed that the Soviet Union was close to an operational ICBM capability. They believed, too, that America was behind the Russians in the development of space weapon systems, and that America would need to undertake a vigorous program to regain a balance of power in space.

In the course of a thorough inquiry, these beliefs seemed to find expert substantiation. From November 25 until January 23 approximately seventy witnesses appeared before the committee in both public and executive sessions; questionnaires were circulated to almost two hundred individual organizations, scientists, engineers, educators, and industrialists; and the total printed testimony ran to more than seven thousand pages.¹⁸⁰ Inevitably, in this broad effort, the space program came under scrutiny.

One set of problems which the committee considered was the overall coordination of the missile and satellite program. Johnson, Stennis, and Bridges were especially concerned with this issue; Stennis inquired repeatedly whether there should not be some single individual who could make binding decisions upon the DOD and the Budget Bureau in the satellite and missile field. The committee found the chain of command in the missile program confusing and Killian's role ambiguous. When informed that Killian was primarily an adviser, it expressed disappointment that he did not have control over the entire satellite and missile effort.¹⁸¹ Although it did not favor either military or civilian organization in its January report, the committee did urge a centralized locus of responsibility for space. Senator Kefauver was perhaps most articulate on the organizational issue, arguing that the DOD's dominance in space development would, in effect, exclude substantial scientific research—an activity he considered exceedingly valuable. In the hearings, Kefauver favored a Secretary of Science to coordinate such nonmilitary applications of space. Although this alternative never won wide support, it did identify the need for a coordinating mechanism to mesh military and nonmilitary space projects—a problem which neither the scientists nor important members of the administration had yet directly faced.

These deliberations about space were always set, however, in the broader context of national defense policy. In the hearings, the Senators concentrated chiefly on the DOD's effort. As the inquiry wore on, they became critical of the Department's competence in scientific research and development. In this context, the committee

criticized the department's organizational arrangements for the missile and satellite programs; its estimates of the existing military situation; and its failure to anticipate the space challenge. It dealt with particular harshness with Quarles and Holaday, responsible officials before the Sputnik crisis. Chief Counsel Edward Weisl and Senator Johnson were brusque in their questioning of both men and emphatic in their belief that the officials lacked a real sense of urgency. After a particularly acid review of Quarles' speech to the U.S. Conference of Mayors, in which Quarles argued that the Soviet Union did not have an operational ICBM capability and that its satellites had not been of military significance, Johnson remarked:

If that is your idea of a speech that is calculated to arouse people... to spur them to expedite the existing program, to chart new courses, to outline new goals, to regain a superiority that has been lost... then your evaluation of the effect of the speech is different from mine.... There is a great feeling, I think, in the committee and in the country that there has been nobody in a real hurry about this whole situation and there has been a lot of public officials who have been making statements which are calculated to laugh the whole thing off.¹⁸²

Never losing this suspicion of the DOD, the subcommittee came to feel that the OSD was less concerned about space than the Congress, some scientists, some service representatives, and the public.* Nor did the committee conclude that the department had sufficient appreciation of the value of scientific research. It exhaustively reviewed the present satellite program; then expressed shock, consternation, and incredulity about the whole affair. In particular, it disapproved of the department's refusal to recognize the propaganda value of satellites by failing to authorize Project Explorer after September 1956.¹⁸³ To the Senators, the current satellite effort seemed "relatively small... relatively unsuccessful, and certainly late."¹⁸⁴ To the committee, the Vanguard decision and its dismal aftermath underscored the danger of assigning low priority to scientific, in contrast to military, research and development, and of making decisions on the basis of service rivalries. To the members, the need for new arrangements for advanced research and development was clear.

*Indeed, this conviction led to a game of "can you top this" between Weisl and Quarles:

WEISL: I know that the members of the Committee, after hearing the evidence that we have heard, are tremendously aroused over the potential threat.

QUARLES: I doubt that any member of the Committee is any more aroused about the threat than I am, Mr. Counsel.

WEISL: And we feel that the public must be aroused... so that they will make the sacrifice... necessary to meet that danger.

THE ESTABLISHMENT

As a consequence of its leadership, its meretricious representatives of the establishment, a more urgent effort was necessary to meet the challenge of the congressmen. The scientific witness, Teller, Bush, von Braun, intent to expand research, also paid its respect to the OSD posture.

Halfway into the decade, it seemed to provide a sense of security. Gavin was pushed by his tenacity in pushing his position and his general acceptance as a crucial factor in the decision on December 10 of fellow that I had heard, and that perhaps a little bit not convinced the fellows."¹⁸⁶ At the time, the fate of the DOD, continued to ignore the clearly impressed

Accordingly, the gravely disturbed situation rubber-hosed Gavin reappeared that he could not budget and intimidate had been clear.

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General, I just thought that it exists 26 years that your capacity

QUARLES: I have just heard of the Commission

WEISL: I can assure you

QUARLES: Pretty accurate

WEISL: Very accurate

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As a consequence of committee skepticism of the civilian OSD leadership, its members gave special weight to the opinions of representatives of the scientific and military communities who favored a more urgent effort. These witnesses possessed the expertise necessary to meet the crisis and they seemed natural partners for the congressmen. The committee displayed marked deference to the scientific witnesses. It praised the loyalty and contributions of Teller, Bush, von Braun, and Van Allen and reiterated the legislative intent to expand research facilities and resources.¹⁸⁵ The committee also paid its respects to military men who might oppose the official OSD posture.

Halfway into the hearings the retirement of General Gavin seemed to provide a dramatic substantiation of the committee's fears. Gavin was popular with the committee, which openly admired his tenacity in pushing Project Explorer in the face of OSD opposition and his general espousal of scientific research and development as a crucial factor in military preparedness. After his initial testimony on December 13, Johnson commented, "You talk like the kind of fellow that I have been looking for ever since we started these hearings, and that is a fellow who thinks that things can be done perhaps a little bit faster and perhaps a little bit better . . . [I am not convinced that] the higher echelons are what I call can-do fellows."¹⁸⁶ At the end of the day, after Gavin had recounted rather vividly the fate of Project Explorer, the need for drastic reorganization of the DOD, and his own fear of the consequences if America continued to ignore space, Johnson and the other members were clearly impressed.

Accordingly, Gavin's announced retirement in late December gravely disturbed committee members, who suspected "administration rubber-hose tactics" might have forced him to resign. When Gavin reappeared before the committee on January 6, he reiterated that he could not support the Army research and development budget and intimated that his chances for assuming a choice command had been denied because of his earlier outspoken testimony.

When he bluntly acknowledged that he preferred to retire rather than mislead Congress, Johnson exploded.

General, I just think this is a horrible situation. I am surprised that it exists . . . I do not think there has been a time in the 26 years that I have been in Congress when we needed men of your capacity, your experience, and your foresight as much as

QUARLES: I have just stated that I was at least as aroused as any member of the Committee, Mr. Counsel . . .

WEISL: I can assure you that the Committee is -

QUARLES: Pretty aroused.

WEISL: Very aroused.

we need them now. We are trying to get to the bottom of this thing. . . . We are concerned; the people are concerned. We want leaders whom we can trust and who will speak frankly, and whose only language is the language of candor. We think you are one of them. . . . I hope, General, that you will reconsider because I do not want an Army or a Navy that is made up of just a group of yes men. I think that that is just what we will get if you come up here and put it on the line as you see it and then resign.¹⁸⁷

Clearly the Gavin resignation further persuaded the Senators that the Administration underestimated the crisis, and made them even more determined to correct the situation.

When the unanimous report was issued, three important themes appeared to form the basis for future Congressional action. First, the Senators were clearly convinced space exploration was an important national objective. Second, they were prepared to consider radical organizational changes, urging that the administration "accelerate and expand Research and Development programs, providing funding on a long-term basis, and improve control and administration within the DOD or through the establishment of an independent agency."¹⁸⁸ Finally, by emphasizing how critical was the situation and the administration's apparent inability to meet it, the Preparedness Subcommittee declared Congress' willingness to embark upon an independent course to assure a greater space effort.

THE LEADERSHIP OF SENATOR JOHNSON As the Preparedness Subcommittee's hearings ended, it was apparent that Lyndon Johnson's early strategies were bearing fruit. Partisan controversy had been minimized and semiautonomous Congressional participation in the policy-making process secured. As the new Congressional session opened in January, Johnson maintained his bipartisan coalition and urged the administration to work closely and informally with a Democratic-led Congress.

That Johnson believed this course of bi-partisan prodding would lead to the best attainable defense posture is unquestionable. In addition, however, he had tremendous personal investment in such statesmanlike behavior. His recognition of the significance of space for him had, if anything, increased since October 4, and he was determined to pursue the course of action he had embarked upon in the Preparedness Subcommittee hearings. In tours across the country he outlined a massive civil and military space program under a new independent space agency; called for increased missile production of such magnitude as to delight the Army and the Air Force and appall the comptroller general of the DOD; and advocated a

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space effort under the United Nations to conquer the new frontier for purely peaceful purposes.¹⁸⁹

The Majority Leader also delivered his own "private State of the Union Message" to the Democratic Party caucus two days before the President's. It was no ordinary review of a committee's findings by its chairman nor an ordinary catalog of problems delivered off the cuff by the Majority Leader to his party. Rather, it was a careful, solemn and eloquent document—widely distributed to the press before its presentation—outlining a long list of popular objectives befitting—as reporters were quick to note—a presidential candidate. It was, in short, Johnson's move to the center of the political arena—a warning, in James Reston's view, that the governments of the Soviet Union and the United States would now have to prepare themselves to deal with Texas.¹⁹⁰

This document—an extraordinary one in American political annals—reveals much of the future character of the legislative process affecting space. That Johnson made such a speech at all indicates the degree of congressional initiative he intended to extract from his colleagues. The contents further suggest the great significance which Johnson, and the Congress which he led, attached to space. Finally, the speech was dramatic confirmation of the individual leadership of the Senator in this area.

Johnson's substantive argument was a simple one. In his mind the exploitation of space by selfish men, *e.g.*, the Soviet Union, was the gravest threat facing the world. By contrast, its exploitation by those devoted to freedom, *e.g.*, the United States or its allies, could both alter the face of the earth and liberate it from all potential enemies. Thus, the major task of the session was to devise an organizational structure and a substantive program which would assure American superiority in space: an incomparable opportunity to save the nation and the world.

Charged with such a task, Johnson recommended several lines of attack. First, he urged that the United States revise its previously low estimation of the significance of space. Second, he made the expansion of America's scientific capability a first aim of national policy—by aid to education, support of basic research, and increased military investment in advanced research and development. Third, he urged that scientists manage the space program, since "from the evidence accumulated, we do know the evaluation of the importance of control of outer space made by the United States has not been based upon the judgment of men most qualified to make such an appraisal."¹⁹¹ Fourth, he wanted the United States in a position of unquestioned domination of space. "There is something more important," he argued, "than any ultimate weapon; that is, the ultimate position . . . of total control over earth [which] lies some-

where out in space."¹⁹² This effort would entail development of a missile capability, but would extend far beyond it. More significant, however, was that such military domination would provide, for the first time in history, an alternative to war, and make total security possible. Finally, Johnson called for a new advanced weapons and space agency outside the DOD, on the model of the AEC. Only such a structure, under a President who recognized the significance of outer space for America, could coordinate and maintain a top-priority space program.

The political repercussions of this "message" were immediate and far-reaching. It was clear that Johnson, for his own and his country's welfare, would press for a major space effort. How far he would pursue this goal within his self-imposed confines of positive cooperation with the administration remained an open question. Two facts were certain: he would await the initial suggestions of the administration in order to build upon them according to his evaluation of their merit. And he would be a potent ally for any other official or group who wished a greatly expanded program in scientific and military exploitation of outer space.

There was nothing parochial in Johnson's position. Unlike military spokesmen or scientists, he was vitally concerned with both aspects of space exploitation. He delved deeply into the substance of the program as he sought to shape its future form. The result of his effort was to establish his own interests and those of the Congress at a level of importance rarely seen in the process of policy-making in a modern state.

Johnson was not the only congressional figure with a role to play in the space issue. House Majority Leader John McCormack emerged as a secondary power in the legislative process. His concern with space stemmed from a long-time personal interest in scientific progress and in science-based industry such as that surrounding his home district in Boston. He had been involved with governmental scientific development since he served as a Congressional watch-dog for the Manhattan Project in World War II. He felt close personally to MIT and to its former President, Dr. Killian. He thus was instinctively sympathetic to the efforts of the President's new special assistant. McCormack's behavior in the legislative process concerning space was more conventionally bipartisan than Johnson's. While perhaps as interested in space as the Senator, he acted more to expedite policy than to initiate it, and was in general willing to accept administration leads.

Finally, although no other members of Congress were so crucially concerned with space as Johnson and McCormack, a variety of proposals for space policy were introduced during the initial months of the session. The most significant of these supported

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federal aid for education, new governmental organization of the scientific effort, and reorganization of the DOD. Others specifically dealt with space. Prior to the submission of the administration's space bill, the bills reflected particular authors' interests, whims, and loyalties. Senator Anderson and Representatives Holifield and Durham, for example, all members of the Joint Committee on Atomic Energy, introduced similar bills amending the Atomic Energy Act of 1954 to develop outer space through the peaceful application of atomic energy.¹⁹³ Other Democratic congressmen suggested that independent commissions be established to organize the space effort.¹⁹⁴ Three bills were introduced by Republicans building an outer space agency upon NACA by amending the Act of 1915 and expanding NACA's mission.¹⁹⁵ Finally, Representative Keating introduced a concurrent resolution expressing the sense of Congress that the United States take the lead in efforts to gain an international agreement that outer space be devoted to peaceful purposes.¹⁹⁶

As opposed to this scattering of bills, Johnson waited until the administration proposal was in before he chose to act. Giving no backing to any, he preferred to place the administration's legislation under severe congressional scrutiny. At the same time, Johnson exerted such influence over the administration and the rest of Congress that his views of the important issues in any impending space effort would set the agenda for this congressional policy-making.

ORGANIZING CONGRESS FOR SPACE One further sign of the exceptional pattern of congressional activity was that body's special internal attempts to handle the new issue. Ordinarily, space legislation would be referred to existing committees according to the content of the particular bill. Now proposals appeared to grant jurisdiction in space to the Joint Committee on Atomic Energy; to create a joint Committee on Outer Space; and to establish separate House and Senate Standing Committees on space. An initial move was made by the Joint Committee on Atomic Energy when Carl Durham, its chairman, announced the establishment of a Special Subcommittee on Outer Space Propulsion, with Senator Anderson as chairman.¹⁹⁷ After a certain amount of negotiating over conflicting jurisdictions, Johnson, with Senator Knowland's support, introduced a resolution prepared by the Preparedness Subcommittee creating a Special Committee on Space and Astronautics to frame legislation for a national space program.¹⁹⁸

The resolution passed the Senate on February 6 and the committee was "authorized and directed to conduct a thorough and complete study and investigation with respect to all aspects and

problems relating to the exploration of outer space and the control, development and use of astronautical resources, personnel, equipment and facilities."¹⁹⁹ It consisted of seven Democrats and six Republicans, a blue-ribbon group which included eleven ranking members of the six standing committees whose fields of jurisdiction space might affect. The committee was considered so prestigious that the Senate leadership invoked the seniority rule to select its members: Bridges, the ranking member of the Appropriations Committee; Russell and Saltonstall, the chairman and ranking member of the Armed Services Committee; Anderson and Hickenlooper, the vice-chairman and ranking Senator of the Joint Committee on Atomic Energy; Green and Wiley, chairman and ranking member of the Foreign Relations Committee; McClellan and Mundt, chairman and ranking member of the Committee on Government Operations; Magnuson and Bricker, chairman and ranking member of the Interstate and Foreign Commerce Committee; Symington, a member of the Armed Services and Government Operations Committees who, although outranked on both, was selected on the basis of his wide experience in government; and Johnson, who had introduced the resolution and thereby traditionally qualified for selection. On February 20 Johnson was elected chairman.

This committee was especially qualified to execute Johnson's space policy. As a function of their status, its members were relatively autonomous political powers. Many had gained experience in the Preparedness Subcommittee hearings. Johnson himself chaired the group, thus guaranteeing the bipartisan, strongly congressional quality which had characterized his efforts throughout the year of the Sputnik.

Reflecting a certain amount of rivalry between the two chambers, the House leadership soon set up a parallel group. At the suggestion of Representative Vinson, Chairman of the Armed Services Committee, Overton Brooks introduced a resolution to create a select committee on space on February 11. The leadership of both parties supported this resolution at first, but later the measure was withdrawn in favor of one introduced on March 5 by McCormack.²⁰⁰ This new solution permitted McCormack rather than Brooks to assume the chairmanship, an unusual provision since a House Majority Leader does not normally chair a committee. The House, however, sought an eminent spokesman on a par with Johnson to give added dignity to the new committee. Like the Senate, the House established a thirteen-member select committee to be chosen by the party leaders. In contrast to the Senate measure, however, which had established membership "on the principle of representation from specified committees with related interests," no such formal provision was made in the House

resolution.²⁰¹ Joseph Some members were: Brooks and Natcher and Ford Foreign Affairs; and merce. Keating, M members.²⁰²

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resolution.²⁰¹ Joseph Martin, the Minority Leader, was appointed. Some members were chosen because of prior committee assignments: Brooks and Arends from the Armed Services Committee; Natcher and Ford from Appropriations; Hays and Fulton from Foreign Affairs; and O'Brien from Interstate and Foreign Commerce. Keating, Metcalf, Sisk, and McDonough were the other members.²⁰²

Besides these organizational moves, the Congress passed on February 12 PL 85-325, enabling the DOD to pursue basic and applied and research development for military requirements and authorizing the DOD to undertake, for one year, any advanced space projects designated by the President.²⁰³ In effect, this law established the ARPA to pursue the ongoing nonmilitary space program until Congress made more permanent organizational arrangements. On the previous day the Supplemental Defense Appropriations Act of 1958 had appropriated funds for such activities.²⁰⁴

Thus, Congress indicated a broad concern with the organization of the space program. First, in setting up special committees to study the space effort, the houses of Congress were delineating a new area of congressional activity—a step not taken lightly in the national legislature, where new missions are more typically handled in old structures. Second, the specific authorizations of acceleration in the present space effort were tentative ones: signaling the congressional expectation that a new approach to space would soon be forthcoming. Third, Congress had, in effect, indicated that at least a portion of the space effort would be in civilian hands. There were no serious proposals to organize the entire space program under the DOD or to place congressional review of space in the Armed Services Committees. Indeed, by permitting ARPA responsibility for civilian space programs for only one year, Congress indicated its unwillingness to give the military an unlimited mandate in space.

Most important of all, these first steps made clear that Congress gave high priority to the future space program and its organization. Neither defensive nor moderate in its attitude toward space, disposed to push both civilian and military programs, Congress wanted a major space effort. It exerted its own authority in expressing these views, making it clear that the final space program would be a joint executive-legislative effort.

Like other participants in the formulation of space policy, Congress remained dependent upon the President to show his hand. With the scientists and the military spokesmen, the legislative branch required a focal point for its positions. Now having established its preferences and objectives, the leadership in Congress awaited the administration bill before making its final round of strategic choices.

Presidential Choice: The Drafting of the Bill

The administration chose a visible, substantial response to Sputnik: the establishment of a high-level agency with a clear mandate to pursue broad programs of exploration and development in space. The bill submitted by the President proposed an independent civilian space agency under a single administrator, charged with the direction of basic research and nonmilitary projects in outer space. It was faithful in its provisions to Eisenhower's earliest reactions to the challenge in space, primarily his insistence upon civilian control for nonmilitary space programs.²⁰⁵ It reflected, too, the aims and preferences of three special groups of influentials who came to dominate the drafting process.

That process, which began in the executive office just after the launching of Sputnik II, was a relatively secretive one. It initially involved officials from the White House, particularly from PSAC and Killian's office. Later it included the Bureau of the Budget and NACA, upon which the new agency was built.

The Killian appointment and the reconstitution of PSAC in the White House offices during November precipitated discussion about the form of the future space program. This initial evaluation lasted throughout November and into December. "As soon as the outlines of an expanded and accelerated space program emerged from the deliberations," the White House agreed that civilian and military aspects of space exploitation should be given organizational recognition in two separate agencies.²⁰⁶

The original suggestion to place the civilian and scientific space missions within an enlarged NACA and to permit continued DOD participation in military space programs appeared to come from NACA and from the Space Sciences Panel of the PSAC, the advisory group given primary responsibility for considering the new mission.* By January this proposal was the accepted position of the PSAC.²⁰⁷ Given this decision, in late December Killian, in his dual capacity as chairman of PSAC and Special Assistant to the President, approached the Director of the Bureau of the Budget, asking that the bureau undertake organizational and administrative planning for the space program.†

*A source within PSAC cites Dr. James Fisk, a member of the panel, as the originator of the proposal.

†The Bureau of the Budget is statutorily charged by the Budget and Accounting Act of 1921 with responsibility for evolving and overseeing the organization of governmental activities. Thus, it was standard procedure for Killian to request assistance from the Bureau's Office of Management and Organization in establishing this new administrative structure.

Concurrent with its public campaign, NACA did not participate in the deliberations of Dr. James H. Doolittle's committee during this period. NACA also did not participate at this time, and while it was not involved in the final decision, it did express its own preferences.

Thus, by the time the bill was drafted, whom Eisenhower chose for the agency and the agency's legal basis, the base on which NACA was partly guided by Killian's conclusions, the same conclusions that led to the appraisals of a rather high commissioning a high commission.

The interests of the civilian vocally represented by NACA sought a primarily peaceful use of space, important peaceful use of space, military control. NACA's ongoing mission was to expand at a rate consistent with the civilian interests.

PSAC's organizational conception of the space program, as later outlined in the report on the mission to Outer Space, was the advancement of space exploration of man to explore space for prestige; and new experiments.²¹⁰ Of the scientific interest in space for scientific satellite, a "remarkable way to the future utility of space." ²¹¹

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Concurrent with the discussions within the PSAC, NACA initiated its public campaign for the space mission.²⁰⁸ NACA itself did not participate in the PSAC's original consultations, but its chairman, Dr. James H. Doolittle, was a member of the PSAC during this period. NACA also made recommendations to the White House²⁰⁹ at this time, and while NACA officials were not themselves involved in the final decision, certainly the administration was made aware of their preferences.

Thus, by the end of January, the group of scientific advisers whom Eisenhower had charged with designing a space program and the agency's leadership were agreed that NACA would be the base on which NASA would be built. The Bureau of the Budget, partly guided by Killian's report of PSAC's deliberations, reached the same conclusion. Rapidly a consensus emerged from separate appraisals of a rather complicated administrative problem, suggesting a high community of interests.

The interests were overlapping—but not identical. PSAC, vocally representing the interests of the scientific community, sought a primarily civilian structure in which basic research and important peaceful space missions could be pursued free from military control. NACA provided such a structure. Furthermore, NACA's ongoing nucleus of research facilities and staff could be expanded at a rate which the scientific advisers considered consistent with the overall scientific interests of the government.

PSAC's organizational preferences stemmed from that body's conception of the substantive space program. These guidelines—as later outlined in the Purcell Committee's report, "An Introduction to Outer Space"—identified four major factors which made the advancement of space technology imperative: "the compelling urge of man to explore and to discover"; defense objectives; national prestige; and new opportunities for scientific observation and experiment.²¹⁰ Of these four, the committee was primarily concerned with scientific inquiry, outlining a variety of research purposes for scientific satellites. It argued that in the past pure research had a "remarkable way of paying off" and that, while it could not predict the future utility of space ventures, the "scientific questions come first."²¹¹

Furthermore, the committee was skeptical about the potential military uses of outer space.

Much has been written about space as a future theater of war, raising such suggestions as satellite bombers, military bases on the moon and so on... for the most part, even the more sober proposals do not hold up well on close examination, or appear to be achievable at an early date.... In short, the earth would appear to be, after all, the best weapons carrier.²¹²

With such emphasis on civilian space activities as a part of a total scientific program, building NASA around NACA seemed to PSAC the "natural" organizational solution.

On NACA's part, interests of organizational survival coincided with a substantive outlook similar to that of PSAC.²¹³ NACA acknowledged the importance of military objectives in space more readily than PSAC, but NACA spokesmen concurred that civilian and scientific objectives might well be subordinated in a military agency. Thus NACA favored separating civilian from military exploitation of space, viewing this two-space-agencies solution as parallel to the dual NACA-DOD structure which had supported aeronautical technology for forty years.

Finally, the Bureau of the Budget viewed NACA as an administratively neat solution by its own special criteria. The bureau as a rule does not enjoy creating new executive agencies, on the theory that current administrative resources should be utilized for new missions if at all possible. In Director Maurice Stans's words:

Retrospectively, a major objective of the legislation was to build upon existing institutions and to avoid increasing the total number of Federal Agencies involved in aeronautical and space matters.... The bill accomplishes this aim by utilizing the NACA as the nucleus of the new agency.²¹⁴

Thus, the upgrading of NACA offered an efficient and economic administrative arrangement.

Initially, the bureau expressed some difficulty in designing the structure for a new space program by conventional organization and management principles. Associate Director William Finan believed that the management planners had "read too much, or perhaps too little, science fiction in the past... and that it required the applications of a special mental discipline to be sure that they were planning for the organization and administration of the program being officially conceived and not for the even more fantastic projects being speculated about in public."²¹⁵ When Killian specifically requested aid in drawing up the bill, however, the bureau had an opportunity to include its favorite tenets of streamlined administrative management.

Thus, by February 4, when Eisenhower publicly announced the establishment of the Purcell Committee and charged it with delineating America's future space program, the Executive Office had already agreed that a new civilian space agency would be built upon the NACA structure.²¹⁶ Thereafter, the drafting process proceeded with an increasing sense of urgency. Public and governmental uncertainties about the management of the space mission were rising, and the President was eager to send a bill up before

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the Easter recess, President congressional was thus done ungroup of policy matters of the Budget.

The actual drafting of the bill began in February. The major drafting was done by the Division of Organization and Administration, the Assistant Secretary of the Navy, one of its senior staff officers, NACA; S. Paul Johnston, Sciences and Technology, as staff for the President's assistant counsel to the bureau.

The Bureau of the Budget drafted legislation. It was drafted by Brundage and Finckelstein through Johnston. and one can best understand his capacity as Eisenhower's first agent of the President for the legislation. The Majority Leader was establishing a "heart" in that the Space bill as it evolved.

NACA's views were submitted to the committee. Director Killian and additional organizations provided a chairman for the drafting committee.

Out of this committee of the National Aeronautics and Space Council, a consensus in general principles and particular philosophical provisions. of flight within a development, test aircraft, missiles, activities were to control over aeronautics except insofar as such activities were related with weapon agency may act in

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the Easter recess, eliminating any further opportunity for independent congressional space policy-making. Work on the legislation was thus done under "crash" conditions by a selected and limited group of policy makers in Killian's office, the NACA, and the Bureau of the Budget.

The actual drafting committee met first in late January or early February. The men worked under the overall aegis of the bureau's Division of Organization and Management and consisted of William Finan, the Assistant Director in charge of that division; Alan Dean, one of its senior staff members; Paul Dembling, the legal counsel to NACA; S. Paul Johnston, Director of the Institute of the Aeronautical Sciences and temporarily a member of Killian's staff who also served as staff for the Purcell Committee; and finally, Kenneth McClure, assistant counsel to the Department of Commerce on loan to the bureau.

The Bureau of the Budget took overall charge of evolving the draft legislation. Killian had frequent contact with Budget Director Brundage and Finan, as well as direct access to the drafting process through Johnston. Killian took an active interest in the proceedings, and one can best define this "Administration Bill" as Killian's bill in his capacity as Eisenhower's personal adviser. Killian also was the first agent of the administration to mobilize congressional support for the legislation through several private discussions with House Majority Leader McCormack with whom he remembered establishing a "heartening relationship."²¹⁷ PSAC also participated in that the Space Sciences Panel of PSAC saw various drafts of the bill as it evolved.

NACA's views were also well represented to the drafting committee. Director Dryden had three or four discussions with Finan, and additional ones with Killian and Brundage. Dembling also provided a channel of communication between NACA and the drafting committee.²¹⁸

Out of this convergence of interests, the administration's draft of the National Aeronautics and Space Act of 1958 reflected consensus in general policy objectives and a special blending of particular philosophies and preferences in the detailed organizational provisions. The bill provided for "the solution of problems of flight within and outside the earth's atmosphere and... for the development, testing and operation for research purposes, of aircraft, missiles, satellites and other space vehicles."²¹⁹ Such activities were to be directed by a civilian agency "exercising control over aeronautical and space research sponsored by the U.S. except insofar as such activities may be peculiar to or primarily associated with weapons systems or military operations, in which case the agency may act in cooperation with, or on behalf of the DOD."²²⁰

Below this level of generality, PSAC and Killian abandoned the long-standing preference of the scientific community for a multi-member, executive unit composed of private citizens with professional scientific backgrounds, thus breaking sharply from the pattern established in NACA, the AEC, and the NSF. The spokesmen for professional science had come to value the administrative pattern which the Bureau of the Budget had long espoused as a basic principle of public administration: the single-executive structure which placed reliance on generalized administrative competence and limited the plural-member, specialized body to an advisory role.

Thus, major operating authority in the new agency would be vested in the director, appointed by the President with the advice and consent of the Senate. He would control the shaping of the research program, the construction and management of facilities, and the establishment of the contract provisions for private enterprise. Such an administrative structure would be most amenable to clear executive coordination and control, thereby avoiding the pitfalls of vested interests, potential military domination, or powerful Congressional alliances which a more autonomous administrative structure might induce.

The National Aeronautics and Space Board was to consist of not more than seventeen members, of whom not more than eight would be from appropriate departments or agencies of the government, including at least one from the DOD. The others would be eminent private citizens. The board's role was to advise the President and the director—later the administrator—of the agency on government policies and programs in space. It would be consulted by the director prior to initiation or substantial modification of policies or programs.

Two other principles long favored by public management experts in the bureau were also incorporated. The drafters relied on administrative flexibility and interagency cooperation in place of detailed prescriptions to set the boundaries of agency operations. In the first instance, the enabling language was general, since the character of the space mission was so relatively unknown. Relatively unfettered executive discretion would permit the President and the director to continue to shape the substance of the space effort. Second, interagency coordination was to be secured through regular channels of the executive branch: the legislation avoided statutory liaison committees or specific designations of membership on the advisory board.

In short, the liaison process was to continue the informal relations with the DOD, NSF, AEC, Weather Bureau, and Department of State that NACA had previously established with considerable success. Where working-level liaison and joint participation in

space projects broke and ultimately determined emerged not as an end in itself but as a means to space activities but not specifically devoted to performing space experiments, and cooperation with other agencies, and cooperation in research and development.

These concepts were confirmed by the fact that they confirmed the traditional role of the Budget Bureau prior to the scientists as a check on the Budget Bureau prior to the working "kitchen stove kind" of complete with such Civil Service classification, an extremely liberalized the Budget Bureau space program and the purest tenets of the

As for the space activities, the given its basic tenets DOD activities but, clearly delineated, case of controversy. Similarly, no specific drafters considered should cooperate in utilization of space for propulsion for outer space required, especially the language to the establishment and

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space projects broke down, the President would resolve disputes and ultimately determine overall national space policy. Thus NASA emerged not as an overall national policy-making agency for outer space activities but rather as a regular arm of the executive branch specifically devoted to pursuing basic research in space sciences, performing space experiments in conjunction with other government agencies, and cooperating with the military establishment in research and development of military interest.²²¹

These concepts were supported both by NACA and PSAC, for they confirmed the old agency's working experience and appealed to the scientists as logical extensions of their basic aims. But the Budget Bureau provided the rationale for the arrangements. To Finan, the working group had a priceless opportunity to write a "kitchen stove kind of bill" based on optimal administrative theory, complete with such heretofore exotic touches as exemption from Civil Service classification requirements for scientific personnel and an extremely liberal patent policy.²²² This sort of design for NASA, the Budget Bureau felt, could both assure a superior American space program and provide a model agency which conformed to the purest tenets of administrative theory.

As for the specific relations between military and civilian space activities, the draft was almost cryptic—understandably so, given its basic tenets. There was enabling language included for DOD activities but, on the assumption that these projects could be clearly delineated, no specific liaison structure was proposed. In case of controversy the President would be the final authority.²²³ Similarly, no specific references to other agencies appeared. The drafters considered it unnecessary, for example, to state that NASA should cooperate with the State Department to assure peaceful utilization of space or with the AEC to foster development of nuclear propulsion for outer space vehicles. A "straight line" operation required, especially in the Budget Bureau's view, no special statutory language to confirm the natural workings of the executive establishment and the plenary powers of the President.

Reasoned and reasonable as the administration's bill may have seemed, however, it remained the product of a limited group of congenial interests. Neither the State Department nor the Weather Bureau was consulted,²²⁴ though each had a role to play in future space programs. More important, the military establishment was, for the most part, bypassed. A few individuals from DOD did participate: General Schriever had a discussion with PSAC scientists during January or February in which scientific exploitation of space was the sole topic; Dr. Herbert York in his capacity as a member of the PSAC Space Sciences Panel "sat in on many arguments" about the organization of the new agency before his

appointment in February to the DOD as chief scientist of ARPA.²²⁵ But no ARPA, Army, or Navy personnel were included. Instead, they heard "rumors" that a civilian agency was to be built upon NACA.²²⁶

To Executive Office personnel, these omissions appeared natural ones, for they assumed a relatively limited and clearly defined military space mission. Moreover, the military establishment may have inadvertently encouraged the deemphasis on liaison arrangements. As Roy Johnson noted later in May:

Within the DOD, up until just recently, there was a feeling that [the new agency] was basically an extension of the relationship with NACA as it existed in the past and there was not much concern about the language [of the bill] or the change in relationship as I interpreted it.²²⁷

Nonetheless, what the narrowly based drafting group gained in initial unanimity, it paid for in later criticism and conflict. In early March the completed bill cleared the President's Advisory Committee on Government Organization. Dryden reviewed it for a week and suggested some changes, and then the Bureau of the Budget began the normal process of interagency clearance. Compared to the usual procedure, the period of circulation was short, lasting from the afternoon of Thursday, March 27, until noon on Monday, March 31, although the bureau accepted additional comments through April 1. The bureau took the position that those departments with a substantial interest were already familiar with the major provisions of the bill and thus were expected to keep their comments to a minimum.²²⁸

The bureau's expectations were not fulfilled. DOD, the State Department, the Weather Bureau and a few other agencies protested the short time period in which they had to comment. The general counsel's office, which was responsible for coordinating the DOD position toward the bill, allowed the various subdivisions of the department only twenty-four hours in which to comment. This restriction applied to the services and the ARPA and led to Senator Johnson's later observation that the draft had "whizzed through the Pentagon on a motor cycle."²²⁹ York and Roy Johnson of ARPA and Assistant Secretary MacIntyre of the Air Force all testified later that they had discussed certain reservations about the bill's demarcation of military-civilian space jurisdiction with the general counsel and Quarles during the day allotted to them, but that their ideas did not get into the draft. Each was unhappy with the deadline and argued that a longer period could have produced a better bill. Brucker and Medaris, while not submitting formal comments to the OSD also expressed reservations to Quarles which did not see print.

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Nevertheless, at this stage. The OSD considered the DOD-NACA provisions to mean the space mission as if ARPA was foreclosed by agency clearance procedures behind the administration of the military program. NASA like NACA believed that OSD was willing "a draft in which DOD the NACA participated in the bill the administration

Apparently, the conflicts arising from through executive action of Defense and the DOD to coordinate the National Academy of Sciences to prepare an agency either through facilities to NASA. plans for the assumption of the internal-management of the space program. The NAS for the program goals. For Congress a full set of objectives.²³³

By April 2, 1959, among the alternative solutions. The administration of the scientific committee of advisers and the solution also for the military exploration of budgetary reasons of space without a

This confluence estimate the force did make a substantial space effort. Yet, the factors and manipulation of the President to s

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Nevertheless, open interagency conflict did not result at this stage. The OSD concluded that essentially the bill was an extension of the DOD-NACA relationship and interpreted its enabling provisions to mean that the DOD was still free to pursue the military space mission as it chose.²³⁰ Thus, dissent by the services and ARPA was foreclosed for the moment. Yet, significantly, the inter-agency clearance process did not produce full executive support behind the administration bill. The civilians continued to minimize the military program. The OSD remained content in its belief that NASA like NACA before it would function as a helpmate in projects that OSD was willing to relegate to it. And the legislation remained "a draft in which Dr. Killian's office, the Bureau of the Budget, and the NACA participated."²³¹ The compromise among them was the bill the administration sent to Congress.

Apparently, the President expected to surmount the latent conflicts arising from different expectations of the space program through executive action. On April 2, in a message to the Secretary of Defense and the Chairman of NACA, Eisenhower directed the DOD to coordinate space projects with NACA, the NSF, and the National Academy of Science.²³² He also asked the defense establishment to prepare an operating plan to assure support for the new agency either through cooperative arrangement or by transfer of facilities to NASA. Finally, he instructed NACA to prepare detailed plans for the assumption of its contemplated responsibilities both for the internal-management structure of the new agency and its projected space programs, including arrangements with the NSF and the NAS for the participation of the scientific community in setting program goals. Finally, Eisenhower asked NACA to present to Congress a full explanation of the proposed legislation and its objectives.²³³

By April 2, then, the President had made public his choice among the alternative organizational structures for the space mission. The administration bill aligned the President with the views of the scientific community, specifically those of his personal scientific advisers and the nonmilitary government scientists. The proposed solution also fulfilled the administration's desire to downgrade the military exploitation of outer space for both strategic and budgetary reasons and its wish to capitalize on the political appeal of space without an open-ended assignment of energy and resources.

This confluence of objectives made it difficult, of course, to estimate the force of the scientists' influence. Clearly, the scientists did make a substantive contribution to the initial design of America's space effort. Yet, like most men in politics, they were both manipulators and manipulated, members of the strategic alliance forged by the President to serve a number of potentially gainful political ends.

The Second Round of Policy-Making: The Legislative Process

On April 14, Senators Johnson and Bridges introduced the administration's bill as S. 3609, and Representative McCormack filed the same measure as H.R. 11881. The filing of the bill provided Congress with its own opportunity to take formal and final positions on the organizational issue. It also offered other political activists their last chance to reassert their own policy interests. At this stage, interested elements of Congress could fashion informal alliances with unsatisfied elements within the executive branch. In this instance, Johnson's drive for an independent policy-making role, and the military services' concern that their own role in space was minimized combined to revise substantially the National Aeronautics and Space Act of 1958.

ENTERING THE LEGISLATIVE ARENA

Hearings on the bill opened in the House on April 15 and in the Senate on May 6. During the subsequent weeks spokesmen for the administration, the scientific community, the DOD, and the services testified before two congressional bodies. Each of these groups developed distinct attitudes toward three key issues: the respective roles of the DOD and NASA in space; the sources of decisions allocating activities to each; and finally, the role and proper composition of the National Aeronautics and Space Board. In one way or another, all three issues concerned the distinction between military and civilian space efforts and the need to establish an organization which could at once insure both sufficient basic research in space without obvious program payoffs as well as research and development immediately relevant to the demands of national security. The military establishment appeared in the main not to recognize the need for sufficiency; the scientists often failed to acknowledge the need for relevancy. To many of the participants in congressional deliberations, the administration bill satisfied the first criterion but failed to give due weight to the second. The prospects for major organizational modifications in the legislative arena were thus evident at the outset.

Dryden and Doolittle, supported by Stans and Finan, presented the administration's case. They reiterated their conviction that in regard to the respective roles of the DOD and NASA, the military was empowered to engage in research and development peculiar to weapons systems or military operations. The civilian agency was to

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be responsible for a of military interest, NASA and the President.²³⁵

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and Finan, presented the conviction that in NASA, the military component peculiar to civilian agency was to

be responsible for all others.²³⁴ Decisions about which projects were of military interest would be arrived at by joint consultation between NASA and the DOD, with unresolved disputes left to the President.²³⁵

Representatives of the civilian scientific community and non-military government scientists—still persuaded of the noncontroversial character of many project assignments—also defended the administration's position on this issue. As Dr. Van Allen argued, NASA should have "primary and dominant cognizance of space matters among all Government agencies and . . . only in case it is clearly demonstrated that an endeavor has a direct importance to our military preparedness . . . a direct and significant importance, should the primary cognizance reside in the DOD."²³⁶

As for the basic decision-making for programming space activities, administration spokesmen saw the process working this way. They assumed that the basic research program which must precede any exploitation of space would naturally be located in NASA.²³⁷ Then, they envisioned the DOD presenting its requirements to NASA, which, in turn, would provide the research capabilities for future military developments.²³⁸ Thus NASA would naturally coordinate, if not control, all basic research in the space sciences.²³⁹

So far as the board was concerned, Budget Bureau officials and nongovernmental scientists alike were persuaded that the scientific community ought to be amply represented on the board and that its role was best conceived as advisory rather than liaison. Though government scientists, such as Dr. Waterman and Dr. Wexler, director of the Office of Meteorological Research in the Weather Bureau, emphasized the need for agency representation, they accepted the basic proposition that participation by scientists was the crucial requirement.*

These assumptions were unacceptable to the scientists in military employ. Most of these scientists continued to support civilian control of space but placed great emphasis upon the military utility of the new mission.²⁴⁰ Although they reasoned concomitantly that scientific investigation would have to precede military applications, national security considerations were to them the underlying impetus for space explorations.²⁴¹ Thus, they favored wide discretionary authority for the military to pursue whatever research programs it chose and to establish conclusively the military requirements for the program. Acknowledging the need for coordination of civilian and military aspects, most military scientists urged in-

*An editorial in the June 13, 1958, issue of *Science* rather bluntly made this point by declaring that "the degree of favoritism incorporated into the final version of the Space bill will be one measure of the importance that Congress attaches to the scientific investigation of outer space." (p. 371)

creased representation of the DOD on the National Aeronautics and Space Board.²⁴² They foresaw a broad national space program, formulated jointly by the two agencies.²⁴³

DOD spokesmen were even more outspoken in their dissent and broader in the scope of their criticism, for they took exception to substantive as well as organizational matters. As they reflected on the legislation, they became increasingly uncertain that NASA would be just another NACA. In particular, they took violent exception to Section 2 of the bill, which declared that America's activities in aeronautics and space "should be directed by a civilian agency exercising control of aeronautical and space research sponsored by the U.S. *except insofar as such activities may be peculiar to or primarily associated with weapons systems or military operations, in which case the agency may act in cooperation with or on behalf of the DOD.*"²⁴⁴ This provision, they believed, deprived them of control over their own space activities.

On April 2, another presidential action seemed to confirm these fears. In a letter to NACA and the DOD, Eisenhower ordered a division of the space mission in which "the DOD will continue to be responsible for space activities peculiar to or primarily associated with military weapons systems or military operations Responsibility for other programs is to be assumed by the new agency In this connection I commend to the attention of the Congress, the comments of my Science Advisory Committee in its statement on March 26, 1958, on the military applications of space technology."²⁴⁵ The "peculiar to" clause, the ambiguous permission granted NASA to "cooperate" with the DOD, and finally the reference to the Purcell Committee report, with its highly restrictive view of the DOD's space mission, aroused the DOD to legislative counterattack.

Between March 27 and April 14 Roy Johnson, Director of ARPA and an early critic of the bill, convinced Deputy Secretary Quarles that the language of Section 2 threatened military operations. Subsequently, from mid-April until mid-May the OSD was outspoken in its defense of the department's space mission and, led by Johnson, department officials persuaded the administration to amend Section 2.

At the outset of the hearings, the OSD made clear its determination to acquire ample authority to shape its own space mission. Quarles argued that

the Defense Department . . . must have the latitude to pursue those things that are clearly associated with defense objectives as stated here. It must also have the latitude to pursue things that are potentially important to defense and to pursue those within the Defense Department or in cooperation with the . . . civilian agency.²⁴⁶

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seemed to confirm these views. Eisenhower ordered that the program will continue to be primarily associated with military operations. . . . Responsibility for the new agency . . . In the Congress, the committee's statement on March 1954 on space technology.²⁴⁵

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I would construe this language as not limiting the clear responsibility of the DOD for programs that are important to the defense mission, including the support of research that is closely related to the defense mission.²⁴⁷

Herbert York, chief scientist for the ARPA, followed Quarles in reiterating the need for the military to pursue any research with a "reasonable chance of fulfilling military ends"²⁴⁸ without oversight by the civilian agency.²⁴⁹ In effect, the department supported the concept of a civilian agency responsible only for aeronautical and space research "beyond the proper military interests."²⁵⁰

So far as the locus of decision-making power was concerned, in sharp contrast to the drafters' view of NASA as the creative agent, the OSD wished the choice as to whether a given project was military or not to rest with the DOD, under the overall direction of the President. NASA and the DOD, as two independent agencies responsible for separate missions, might coordinate or undertake joint projects in space, but only if both agreed to do so. The OSD interpreted the "on behalf of" clause in military space projects as authorization for NASA to do certain work it was particularly qualified to undertake, but only upon request by the DOD. If disputes should arise over the military character of a project, the military could carry its claim up to the President. In its view, no other agency could interfere in this direct line of command responsible for national security affairs.²⁵¹ Quarles, at any rate, believed that the two space organizations "will have such similar views and objectives on this matter that it will not be a frequent problem for the Chief Executive."²⁵²

Finally, DOD spokesmen saw the board as an informal coordinator of space programs, rather than an agent of mandatory liaison. In particular, they argued that the board should have no power to allocate projects between the military and civilian agencies: this was a task of direct interagency negotiation.²⁵³ In order to insure that the board would sympathetically exercise even this limited role, the DOD recommended increased military membership beyond the single representative provided for in the administration bill. In no event, however, was the board to have binding jurisdiction over defense projects.

Within the context of the overall DOD position, each service adopted a special position traceable to its initial attitude toward the ARPA. The Navy, having opposed a centralized space agency within the military, now faced an even less palatable alternative. A civilian agency would remove scientific space projects even further from Navy labs—and further reduce the service's roles and missions.

Thus, Navy spokesmen were highly critical in testimony. Garrison Norton, Assistant Secretary of the Navy for Air, stated

his personal preference for an executive board representing both military and civilian interests which would control the new agency.²⁵⁴ In stating the Navy's position he qualified his own view somewhat, but argued that the Navy had grave misgivings "about certain portions of the bill as drafted, notably section 2."²⁵⁵ Its language, he felt, should be changed so that NASA would be required to cooperate with the DOD if requested to do so, thus assuring adequate military control over its own space research, development, and vehicles.

Other Navy representatives, such as Raborn and Hayward, also argued that the military's role in space should be anything which the DOD decreed necessary for the national defense. Each also urged increased DOD representation on the board, both to protect military needs and to ensure that DOD and service—hopefully the Navy's—capabilities would be considered and utilized. As their testimony continued, it was evident that Navy spokesmen wanted a reconstituted NACA, faithful to the tradition of passive support of and cooperation with the military services.

The Air Force also viewed the new agency as properly an extension of NACA. Unlike the Navy, however, it supported its establishment with real enthusiasm. Anxious to pursue the space mission as part of its own ballistic-missile mission, the Air Force had rigorously opposed the establishment of the ARPA, viewing it as a dilution of its own natural monopoly of the space effort within the DOD. Now NASA appeared as a convenient receptacle for space research in which the Navy and Army had been engaged, and which was not competitive with present Air Force projects. Hence Air Force personnel strongly backed the creation of a civil agency, secure that its own military space role would be unchanged, or indeed increased.

Testifying on the administration bill, witnesses for the Air Force thus adopted the theme that the military space mission should be recognized as paramount. Civilian and scientific exploration would be useful, but the Air Force "did not attach the same degree of urgency to space exploration per se as . . . to the development of those space weapons which will be vital to the national security during the next ten years."²⁵⁶ NASA should properly have increased authority to pursue space research, but it should not impinge upon the freedom of the military to carry out its own requirements.²⁵⁷ With such an interpretation, the Air Force did not view an upgraded NACA as a threat and was quite content to leave to NASA rather than to another service, residual, nonmilitary space activities.

Consistent with the OSD position then, the Air Force urged that a unit within the military establishment, preferably itself or a highly

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Air Force urged that ably itself or a highly

dependent ARPA, determine which fields were of military concern. Specifically, Schriever and MacIntyre urged that the Air Force be left free to refuse transfer of any space mission or vehicle to NASA if it deemed such a transfer detrimental to national defense.²⁵⁸ To insure its own primacy within the DOD, the Air Force advocated service—as distinct from departmental—representation on the board.²⁵⁹ If any conflict arose between the DOD and NASA over the military or civilian character of a given project, the Air Force assumed that the Secretary of Defense would carry the disagreement to the President rather than depending upon the board to effect coordination.

The Army's view of NASA was almost the precise opposite of that of the Air Force. Testifying before the House committee, Medaris feared "the more the scientific and military are divided, the more difficult it will be for us to really go forward in the research that must be done now if the next generation of military weapons will be as good as those which we may meet."²⁶⁰ He recalled that he had opposed the establishment of a civilian agency before the Preparedness Subcommittee and stated that he had seen no facts which had yet persuaded him otherwise.

Such arguments, of course, were designed to save the space mission for the Army. Since purely military exploitation of space now seemed likely to be lodged primarily in the Air Force, the only way for the Army to retain a space capability would be through a centralized organization within the DOD.²⁶¹ Moreover, the Army advocated a broad spectrum of research as the only source of futuristic weapons systems, and feared that removal of such research from the DOD might seriously jeopardize future preparedness.

As a last line of defense, in the event that NASA were established, the Army supported as broadly integrated a national space effort as possible. It urged that the new NASA should exercise overall surveillance over military as well as civilian and scientific interests in order to insure close cooperation and to utilize available teams. Thus, the Army sought to have the DOD represented on the advisory board through ARPA, rather than the services, a position obviously consistent with the Army's aim of enhancing the role of ARPA within the DOD and ensuring close coordination between the ARPA and NASA.²⁶² Should disputes arise as to the placement of vehicles, teams, or projects between the two agencies, the Army looked either to joint resolution by the two agencies or ultimately the President.²⁶³ Through such provisions the Army sought to avoid a situation in which the Air Force and NASA would gain respective control over the military and civilian space missions. To prevent this outcome, the Army worked to expand the space mission as far as possible; to retain an absolutely, if not relatively,

large slice of the space pie; and to integrate the space research and exploration missions so that capability rather than roles and missions or civilian or military status would determine who would undertake a given project.

The services' differences never disappeared in the course of the hearings, but they were overshadowed by congressional action. The Senate and the House committees reopened far more trenchantly than the critics themselves the question of civil versus military control of space. Thus the OSD and the services found willing legislative allies to extract from a previously reluctant administration an enhanced space mission for the military establishment.

THE HOUSES GO SEPARATE WAYS

What troubled both committees of Congress which were to deal with organizing the space mission went beyond service and agency roles. Congressional leaders concentrated their fire on the absence of criteria by which to determine civilian or military jurisdiction in space; absence of interagency coordinating mechanisms; absence of machinery for overall national space-policy-making; and, finally, absence of substantive provisions to support the sweeping generalizations of the bill's declaration of policy. Congressmen rejected as unworkable the administration's argument that through normal interagency coordination channels NASA and the DOD would either "get along" or take their disagreements to the President. In their view such permissiveness left major policy questions unanswered. These issues boiled down to a central question: should the NASA make policy for either part or all of the space effort or, alternatively, should it merely administer policy made elsewhere, and if so, where? Within this broad issue lay a host of complex questions of a scientific, strategic, and administrative nature on which the two houses of Congress differed in both emphasis and response.

For a number of reasons, the House Select Committee on Astronautics and Space Exploration chaired by McCormack was more civilian in orientation than its Senate counterpart. The committee lacked the background which the upper house had gathered through the Senate Preparedness Subcommittee; only two of its members served on the House Armed Services Committee,²⁶⁴ and it was chaired and staffed by men particularly concerned with the scientific, civilian, and peaceful potentialities of outer space. McCormack and Keating, for example, viewed NASA as a basis for further government organization of science at the cabinet level.

They also repeated outer space before arms control would be, including McCormack of organization like military exploitation body. George Feldman friend of McCormack and was particularly face of total White House but it colored the relations with Kilgore.

Thus the House civilian agency was of space as an undistrusted administrator or to upgrade DOD suspected that the in space was principally not to fashion a major committee members were men, particularly capabilities for a respect for Dryden Feldman more than and McCormack men of vision at quo mind."²⁶⁸ D 150-mile shot of cannon,²⁶⁹ proving the House merely a way to result in "doing it."

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They also repeatedly stressed the need to consider peaceful uses of outer space before military developments progressed so far that arms control would be overly difficult.²⁶⁵ Several committee members, including McCormack, initially preferred a commission form of organization like the AEC, which would place both civilian and military exploitation of space under a single, civilian, controlling body. George Feldman, the committee's chief counsel and a close friend of McCormack, had worked on the AEC legislation in 1946 and was particularly interested in the commission model. In the face of total White House opposition they did not press this view, but it colored their response to NASA.²⁶⁶ McCormack's close relations with Killian also added to this civilian-scientific bias.

Thus the House committee viewed the establishment of a civilian agency with primary responsibility for the exploitation of space as an urgent, necessary mission of the Congress and distrusted administration attempts either to downgrade the agency or to upgrade DOD responsibility in space. Specifically, Feldman suspected that the administration's proposal for a high-level agency in space was principally shaped by a desire to meet public concern, not to fashion a major new program. Both he and the individual committee members vented this suspicion upon administration spokesmen, particularly those from NACA. They distrusted NACA's capabilities for a large space effort and displayed marked disrespect for Dryden,²⁶⁷ the presumed director of the new agency. Feldman more than once referred to the "deadwood in NACA," and McCormack indicated that the new agency would demand men of vision and dynamic leadership, "not men with a status-quo mind."²⁶⁸ Dryden's reference to von Braun's proposal for a 150-mile shot of a man into space as akin to shooting a lady out of a cannon,²⁶⁹ proved especially unpopular to the committee.* Increasingly the House came to view the administration's proposal as merely a way of updating and upgrading NACA—likely only to result in "doing business at the same old stand."²⁷⁰

The committee was especially disturbed by the traditional dominance which the military had exercised over the operations of NACA. The committee did not deny the DOD a substantial role in the space mission; indeed, McCormack claimed that no one on the committee had interpreted the language of Section 2 to exclude ARPA from conducting basic research or as inhibiting the DOD in the performance of its "proper functions." Nevertheless, the committee strove to assure NASA independent civilian status.²⁷¹ In contrast to the views of the military, the House interpreted the language of Section 2, which specified that the agency might act on behalf of or

*This anti-Dryden position of the House committee ultimately denied him his expected promotion as the administrator of NASA.

in cooperation with the DOD in activities related to weapons systems or military operations, as a possible authorization for the DOD to remove all original powers from NASA unless the DOD granted it express permission to pursue space activities. McCormack feared the language gave the DOD "a complete voice in determining to what extent the new civilian agency might operate" since almost all space missions might be associated with either weapons systems or military operations.²⁷² Only after two weeks of hearings was McCormack persuaded that the administration's safeguards for civilian initiative were sufficient. Then he acknowledged that Doolittle's testimony in firm support of a civilian agency had revived his enthusiasm for provisions of Section 2 which had previously seemed vulnerable to military domination.

A second major concern of the House committee was the specific form of NASA-DOD relationships. House leaders sought a civil-military liaison mechanism at the project level. This form of inter-agency coordination seemed to them the most effective means of handling the necessarily large "gray area" which existed between the military and civilian space missions: those projects that could be utilized for both. Feldman and McCormack were particularly adamant about this form of coordination: Feldman invited witnesses such as Herbert Loper, assistant to the Secretary of Defense for Atomic Energy, to testify specifically on this subject, and asked everyone else in sight what he thought of such a liaison system. The committee evidently backed him. In Metcalf's words, "I think it has been developed by Mr. Feldman that no matter what happens to the composition of the board, there has to be daily, constant and continuous liaison between the civil and the military agencies."²⁷³

The board did not fully satisfy the congressmen as an effective means of policy liaison. They objected to the requirements of prior consultation before the director could make certain policy decisions as limiting vigorous executive action. For the same reasons, they objected to the nongovernmental majority on the board. Instead, they advocated a purely advisory committee, vesting overall policy coordination and high-level space-policy-making in the director himself.²⁷⁴ The committee saw NASA as responsible for overall national space policy under the direct control of the President, with the DOD undertaking certain operations and planning according to this policy in the special fields affecting national security. Thus, overall problems of coordination between civil and military operations in space would be solved through "a civilian agency... with direct primary responsibility for an overall civilian, military, research, development, and exploratory policy, as well as the overall primary responsibility for implementing those various programs... thus combining all the functions under one policy-making civilian agency,

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Representatives as an effective requirements of prior certain policy decisions the same reasons, they on the board. Instead, vesting overall policy making in the director responsible for overall of the President, with planning according to national security. Thus, overmilitary operations in agency... with direct national, military, research, as the overall primary programs... thus combining civilian agency,

with the military given its adequate place."²⁷⁵ This high-level-policy execution was to be based upon lower-level coordination through an operating civil-military liaison committee placed in the DOD. Such a lower-level cooperative mechanism, in the committee's view, would permit NASA to take military needs into account while still retaining civilian planning and control.

The Senate committee, while sharing many of the reservations of the House, drew some sharply different conclusions from its deliberations. For a variety of reasons, the committee itself was more preoccupied with military concerns than was the House committee. First, it was operating in a context formed by the Preparedness Subcommittee Hearings. Second, five of its members, Chairman Johnson, and Senators Russell, Symington, Bridges, and Saltonstall, were all members of the Armed Forces Committee. Third, Johnson, having maintained close relations with the OSD over the past months, was thoroughly familiar with military requests for an undisputed sphere of decision-making authority. Finally, Johnson's whole emphasis upon the challenge in space was premised upon the principle "if you would have peace, prepare for war." America, in his view, could only achieve a lasting peace by retaining military control of outer space.²⁷⁶

From the outset, then, the Senate committee was openly hostile to major portions of the administration bill: its failure to insure military exploitation of outer space; to provide overall direction for the space effort; and to recognize various other necessary aspects of space developments, including international cooperation, the development of nuclear propulsion systems, and a reliable patent policy to protect the public interest. It questioned NACA's ability to become a large-scale contracting agency and expressed its initial judgment that the administration bill was only marginally preferable to the present situation of interagency competition in the space effort.²⁷⁷

The Senators were concerned with the difficulties inherent in pursuing both military and peaceful exploitation of space without incurring ruinous competition.²⁷⁸ But they were more concerned that the military program might "deteriorate under perhaps certain imagined or possible civilian attitudes."²⁷⁹ The problem of dividing space activities between civilian and military missions and responsibilities—in short, of insuring both sufficient and relevant space research and development—plagued the Senate as it had the House. As Symington put it: they were all concerned about "how to get as much as possible out of the military departments and at the same time not to affect the military requirement."²⁸⁰

As the hearings progressed, the Senators approached an informal consensus around the need to give the DOD primary opera-

ting responsibility in those aspects of the space mission which affected national security. Mundt and Hickenlooper explicitly remarked that the civilian agency had been given excessive responsibility for military space developments. They viewed the phrase that NASA "may act on behalf of or in cooperation with the DOD" as a clear statement of DOD dependence upon NASA for the definition of the defense mission.²⁸¹

In order to correct this unnecessary restriction, the Senators reached two conclusions. First, they decided that the DOD should have independent authority in the field of its special responsibilities.²⁸² Johnson, in extracting declarations from less than reluctant DOD officials that they would appreciate such authority, in effect forced this powerful group to repudiate a basic tenet of its own administration's bill: that the military would pursue military exploitation of space with the agreement of the civilian agency. Johnson declared that some definite language providing the DOD with such autonomous authority to act in space should be written and wryly observed that he thought the "ingenious DOD" could produce some such wording.²⁸³

Second, the Senate evolved its own form of military-civilian liaison mechanism. The committee had noted throughout the hearings that in the administration bill there was no power vested in anyone except the President to decide what phase of the space mission belonged to which agency. As Symington noted:

Now at the beginning of planning our outer space program, we have an opportunity to provide for some unification. S. 3609, however, does not provide for an overall organization which can plan with foresight for our national and international programs in outer space. Separate agencies are to be separate agencies and are to be separately administered, and voluntary cooperation among coequals is supposed to result in a kind of happy coordination. . . . There is even no provision for settling questions of jurisdiction among the various executive agencies which will be concerned with the exploration of space.²⁸⁴

Not only did such a system seem inefficient to the Senators; such dependence on presidential policy-making was distasteful to Congress in its current mood of autonomous policy-making. Moreover, the Senate committee believed that the President and his scientific advisers depreciated the military potentialities of space to an extent it could not accept. No simple solution such as the House's coordinating channel through a civil-military liaison committee seemed sufficient. The committee sought instead a broad comprehensive new procedure.

What was missing, in the Senators' view, was a high-level policy-making board which could exercise both responsibility and

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authority over the national space program.²⁸⁵ Since many con-
flicts, in the committee's view, would never be resolved if "no one
in any particular agency has the authority to make the decision," the
committee decided to provide a high-level policy board, empowered
to establish national space policy and to determine particular pro-
ject assignments among various operating agencies according to
their military or civil nature.²⁸⁶ Each operating agency would be
free to pursue its own specific mission, but this executive decision-
making body, under ultimate civilian control, would serve to
coordinate, weigh, and direct the various missions which America
was to undertake in space.

So, the two committees, occupied with similar concerns,
arrived at quite different concepts of how the space program should
be organized, and formed alliances with different interest groups
within the administration. Confronted with these contending coal-
itions, it fell to the administration to restyle its own proposal to gain
an acceptable compromise. It was this process of administration re-
treat and congressional bargaining which ultimately produced the
National Aeronautics and Space Act of 1958.

THE ACTORS MEET

In May the military establishment, exploiting the concern of
both houses about the division of function between the civilian and
military space missions, expressed publicly its own reservations
about the administration bill. Its advanced spokesman was Roy
Johnson, whose flamboyant disregard of his role as a member of
the administration made him the natural instrument for such a policy
offensive. Indeed, Mr. Johnson took such an extreme position that
the administration's desire for civilian supremacy was virtually
forgotten. Only solitary voices like those of Dryden, Doolittle,
and Van Allen continued to call for a purely "civilian" bill.

Director Johnson launched his attack upon the administration
bill on May 5. Appearing before the House committee, he stated
that "the legislation setting up a civilian group should not be so
worded that it may be construed to mean that the military uses of
space are to be limited by a civilian agency. This could be disastrous
.... For example, if the DOD decides it is militarily desirable to
program for putting man into space, it should not have to justify
this activity to this civilian agency."²⁸⁷ Johnson proceeded to
explain that the language as it stood required exactly this: that it
did not permit the military to proceed on its own without the
participation of the civilian agency.²⁸⁸ He then offered, on his own
account rather than on behalf of the DOD, his own preferred version

of Section 2: the civilian agency should undertake all space activities except those which may be "in support of or presumed to lead to the use of space for national defense in which case the agency is authorized to act in cooperation with or on behalf of the DOD if so requested by the DOD."²⁸⁹

Johnson argued that the DOD should be free to operate in any field of space interesting to it without any prior civilian approval. The two agencies might work in parallel directions or share voluntarily in a single project, but would be authorized to act independently if they wished. Since only the military was qualified to judge what was of military significance it would be a tragedy, in Johnson's view, if the statute were in any way to reduce its independence by limiting it to clear-cut military objectives. Finally, in response to a pointed question from Representative Keating about his draft suggestion, Johnson acknowledged that he could barely think of a space mission which could not be presumed to be of utility to the national defense.²⁹⁰

Leaving the House to mull over his recommendations, Johnson headed for the other side of the Hill. Two days later he found the Senate committee receptive to his claims, since the committee had heard Quarles that morning say he had no personal objection to an amendment permitting the OSD initial responsibility in military space exploitation. Although Johnson's suggestion that the NASA-DOD relationship be something like the IGY-DOD relationship was too extreme for the committee, he held to his basic position.

Let me put it this way, Mr. Senator. If the AEC had been set up on atoms for peace at that time... then I don't believe that Congress would have appropriated the money... nor the country supported it to the degree that it was supported. If (this) civilian agency is set up on the basis of space for peace or space for fun—I think that a parallel is there.... I think that it has to be set up with a military connotation, with a full understanding on the part of the public that this is a threat. This isn't something we can sweep under the rug by just saying that it is civilian and it is something that by saying it is civilian we can then decide is not a threat.²⁹¹

Receiving at least partial encouragement from Senators Bridges, Mundt, and Hickenlooper, Johnson reiterated the theme he had emphasized in the House: that the civilian and military agencies should be permitted free and independent opportunities to perform space research. In conclusion, Johnson remarked that he really didn't know why there should be a NASA at all, since the NACA was now capable of pursuing nonmilitary space research. As an afterthought he told the Senators: "I understand that even though we are employed within the Government that when we testify

before this Committee and of course I do not want to be here today but I

In the next few days Brucker endorsed Johnson's testimony. The Senate's concern about the language of the conference on May 14 "departmental position" became a position upon the Executive in return for the support of the new

More amendments were conceded to the DOD on the power of final NASA.²⁹⁵ On May 14 a minimum of three

On May 12 Johnson was a co-chairman with Dr. York and Mr. man versed in the appeared to be interrupted. "To short

Mr. Johnson mostly under Executive I gone through the whole I believe Congress son in charge on the way

With this introduction rewritten to read "except insofar as associated with of which activity ment provided board, thus giving represent the

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before this Committee, we are supposed to tell what we really think and of course I do not know whether I will have a job when I leave here today but I am saying what I think."²⁹²

In the next few days of Senate hearings, Norton, MacIntyre, and Brucker endorsed the spirit, if not the letter, of Director Johnson's testimony. The Senators responded by expressing substantial concern about the language in Section 2. When McElroy stated in a news conference on May 8 that Johnson and he were very clear that the "departmental position is [Johnson's] position," the DOD's final position became clear.²⁹³ Between May 7 and 12 the OSD prevailed upon the Executive Office to accept certain of Johnson's arguments, in return for which Johnson accepted administration policy in support of the new civilian agency.²⁹⁴

More amendments were afoot. On May 6 Doolittle publicly conceded to the Senate Committee that increased representation of the DOD on the board would be necessary, and indicated that the power of final decisions over space missions might not fall to NASA.²⁹⁵ On May 11 the Bureau of the Budget conceded to the DOD a minimum of three members on the advisory board.

On May 12 the administration amended Section 2. Called to the House to explain discrepancies in his previous testimony, Johnson was a chastened man. Moreover, he was duly escorted by Dr. York and Mr. Robert Dechert, general counsel of the DOD and a man versed in the ways of administration solidarity. When Johnson appeared to be reverting to his former arguments, Dechert interrupted. "To shorten the procedure," he suggested,

Mr. Johnson has language on the two items that have been mostly under discussion, which language is satisfactory to the Executive Department as a whole, although it has not finally gone through the ordinary reporting processes. I cannot commit the whole Executive Department to this exact language but I believe confidently it will be approved, having talked to the person in charge of policy decisions.... It was written in longhand on the way over, after various telephone calls.²⁹⁶

With this introduction, Johnson read the amendments. Section 2 was rewritten to read that NASA was responsible for space activities "except insofar as such activities may be peculiar to, or primarily associated with weapons systems or military operations, in the case of which activity the DOD will be responsible." The second amendment provided for nine members of the government on the advisory board, thus giving the government a majority, of which three would represent the DOD.

The House committee reacted to this announcement with understandable alarm. Given their earlier fears of military domination over the new agency, this new language disturbed at least the

chairman and the staff. Subsequent testimony did little to allay their concern. Dechert, in emphasizing the administration's agreement on the amendments, stated that it was his understanding "the President does not want to go beyond what he said in his message through fear that, if we go beyond it, it will look as if we are trying to take this away from civilian control. Therefore . . . the administration wants to keep the expression of the DOD participation in the exact words that the President used . . . which are weapons systems and military operations . . . Mr. Johnson has indicated that the research leading up to weapons systems and military operations is necessarily a part of these systems and operations themselves."²⁹⁷

Thereafter, the following exchange occurred:

- Feldman: Would you interpret this language . . . as giving you the exclusive authority to decide without any cooperation or without cooperation with the new agency, what is military?
- Johnson: Yes, Sir.
- McCormack: We might as well put a bill out and put in military control.
- Dechert: Isn't that subject to the fact that both these agencies will be part of the executive department and if those in the civilian agency believed that the military agency had made the wrong decision they always have the right of appeal to the President on it. I think the President is the ultimate arbiter, if there is a disagreement.
- Feldman: Should not some person or agency plan and coordinate all aspects of space research in order to prevent gaps and to insure effective cooperation?
- Johnson: Definitely not, Sir. I think that would be the most tragic thing that could happen to this country.
- York: You do not do that with Maritime. The Maritime and Navy go on and both use the ocean.
- Feldman: Another Pearl Harbor with no coordination.
- York: Of course the purpose of ARPA is to make sure that the Army, Navy and Air Force are together on the space program.
- Feldman: Why not the civilian agency; why not have the same cooperation with them?
- York: If their purpose is primarily to explore space and planets . . . all we need is the information they get. If they are not getting the information that is necessary for defense, we get it ourselves. That is why I think these things can be almost independent.
- Feldman: In other words, when the President now is

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talking of a national space program, national space agency, what you are saying instead is that we should have one for the DOD and one for peace time.

York: I say space is a place and not a program at all. It is a place where you have different programs.
Feldman: Then the President's message does not mean what it says.²⁹⁸

Despite the sentiments of the House staff, in the following days endorsements for the amended version poured in. On May 13 the Bureau of the Budget submitted identical changes for the administration to the Senate, which generally received them as positive improvements, although by no means an adequate solution to the problem of overall coordination in space. Stans indicated at this time that the amendments had the unqualified support of NACA and Dr. Killian. At his news conference on May 14 Eisenhower formally endorsed the new version, and five days later Norton, MacIntyre, and Quarles did as well. Only the Army, now virtually fighting for its life in space, dissented, by proposing yet more drastic changes. In the week from May 20 until May 27, the Army reported no less than three separate versions of Section 2 to Congress. On the twentieth Brucker suggested as a last clause "in which case the DOD shall exercise control."²⁹⁹ Medaris, predictably, was even more adamant. He repeated Brucker's wording for Section 2 but added the language that "the Congress, recognizing that the pre-determination of the primary application of such activities in the vast new field of space may be impossible, hereby declares that where such clear-cut determination appears impossible, the Secretary of Defense shall be responsible for the determination of whether such projects should be carried out by the civilian agency or by the DOD, unless he is otherwise directed by the President." Finally, on the twenty-seventh, Michaelis, chief of legislative liaison for the Army, suggested the following wording for Section 2: "except and insofar as such activities are closely related to missions of the DOD, in which case the agency is authorized to act in cooperation with or as an agent of the DOD." Michaelis, however, felt it necessary to specify that this wording did not represent a policy position of the DOD or of the Army.

Thus the administration had, in effect, completed its final drafting process by acquiescing to elements within itself which had been excluded from the initial writing of the bill. Now, with the exception of the Army, every major element within the administration deemed the compromise satisfactory. There remained the reconciliation between the two congressional committees, still widely separated in their views.

CONGRESS MAKES A LAW

The alliance-building which occurred during the hearings eventually pitted the Senate and the military establishment against civilian scientists, the Bureau of the Budget and the House of Representatives. Each house of Congress consulted the White House to see which of its proposals might be acceptable, and trade-offs between various items in the respective bills were made within limits stipulated by the administration. The precise mix of the compromise, however, was determined by the relationships and relative influence of the two committees and their chairmen.

Since February, when the Senate had established its special committee, a substantial rivalry had existed between the two Houses. McCormack, apparently disturbed by the Senate action, had held the first hearings, an action which in turn aggravated Johnson. Subsequently, there was limited consultation between the two committees, and those contacts which did occur were principally between staff members or between Johnson and Rayburn. Thus each committee drew up its bill with a certain deliberate disregard for the known position of the other.

On May 24 the House committee unanimously reported out H.R. 12575, reflecting the main intent of the original administration bill with a draft providing civilian control for the entire space effort.* Indeed, the House proposal was more civilian than the administration bill after its May 12 amendment, since the committee had resisted administration attempts to persuade it to accept the rewording of Section 2. In the House bill, this section directed the new agency to undertake all space activities except such as may be "peculiar to or primarily associated with the development of weapons systems, of military operations or the defense of the U.S. (including the Research and Development necessary for the defense of the U.S.) in the case of which activities the Agency shall act on behalf of or in cooperation with the Department of Defense."³⁰⁰ The House feared that the vesting of original authority in the DOD for military exploitation of space might hamper the research activities of the civilian agency. Thus, division between military and civilian operations granted the military freedom to pursue broad research and development efforts, but continued to vest final determination of the space program in civilian hands: in the administrator of the agency and ultimately in the President.

*A staff member has described McCormack's desire to achieve bipartisan support for the committee bill. He said that all votes on provisions were unanimous, although there were some partisan "discussions."

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The House bill also included its creature, a Military Liaison Committee in the DOD. The administrator of NASA was to vest operating relations with the DOD in this committee as well as matters involving interagency jurisdiction and joint activities.³⁰¹

In case of disputes not resolved at this level the administrator or the Secretary of Defense might refer the matter to the President for final decision. In addition, the House bill established an Atomic Energy Liaison Committee to effectuate similar coordination with the AEC.

The National Aeronautics and Space Board was renamed the Aeronautics and Space Advisory Committee, composed of nine government representatives, including three from the DOD, and eight private citizens. This committee was a purely advisory body which might consult with the administrator on national space policy and attempt to coordinate programs of various agencies. With responsibility for operational coordination already in the Liaison Committee, overall policy-making fell, in effect, to the administrator and the President, thereby constructing the "straight-line operation" under civilian control which the Bureau of the Budget and PSAC had originally favored.

Finally, the House bill authorized the establishment of a Joint Congressional Committee on Aeronautics and Space; specified that the agency could engage in programs of international cooperation under the foreign policy guidance of the Department of State; and inserted patent provisions modeled on the stringent patent policy of the AEC.

The bill went to the floor on June 2 and passed unanimously after a rather poorly attended two-hour debate.³⁰² The only significant floor amendment was to strike out the provision for a joint committee. This shift was due to a number of factors. Speaker Rayburn preferred a standing committee in order to provide an important chairmanship for Representative Overton Brooks. The House traditionally fears Senate domination in such joint settings. Finally, McCormack himself came to believe that the establishment of a standing Committee for Science and Astronautics, empowered to oversee all scientific activities including space, might contribute to the eventual establishment of a Department of Science.³⁰³

Nine days after the House passed its bill the Senate committee reported out S. 3609, as amended—a vastly different legislative product. The Senate bill provided for original DOD responsibility in those areas of space research and development which pertained to national defense, and for joint civil-military control of the national space program.³⁰⁴ It expanded upon the administration's amended wording of Section 2, so that "activities peculiar to or primarily associated with the development of weapons systems or military

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operations shall be the responsibility and under the direction of the DOD."³⁰⁵ The Senate argued strongly for the separation of the military and civilian space missions on the operational level. On the one hand, the report accompanying the bill stated that "great mischief could be wrought by delegating to the civilian space agency authority over military weapons systems and military operations."³⁰⁶ On the other hand, the report argued that removing operational responsibility for military space projects from NASA would prevent the civilian agency's activities from being inundated by attention to the military applications of space.

Addressing itself to other issues which the House bill covered, the Senate bill established a Joint Committee for Space and Aeronautics, authorized the agency to pursue international cooperative efforts under the foreign-policy direction of the President, and included patent provisions similar to those of the House.

The major innovation of the Senate bill, however, was the establishment of a National Aeronautics and Space Policy Board. In contrast to the limited functions which the House and administration bills had assigned to what the administration called the board, the Senate established a high-level, policy-making organ. Despite the opposition of the Executive Office, particularly Killian and the Bureau of the Budget, to such an administrative structure, the Senate committee viewed this board as the answer to the vexing problem of general space policy-making. Established in the Executive Office of the President and composed of seven government officials (the Secretary of State, Secretary of Defense, Administrator of NASA, Chairman of the AEC, and representatives of three other agencies, only one of which might be from the DOD), the board was obviously a blue-ribbon body. It would direct NASA and the DOD — the two operating space agencies — and coordinate the work of ten other principal government agencies interested in space exploitation.

The Senate report argued that "any differences arising among the agencies concerned in the course of the execution of their functions must be established at a governmental level higher than that occupied by any of those operational agencies."³⁰⁷ Interposed between the operating agencies and the President, the board was to conduct a continuing survey of space activities, recommend a comprehensive program in aeronautics and space exploitation, designate responsibility for major projects, and resolve interagency conflicts: in sum, evolve national policy in space. Its role in relation to aeronautics and space would be "comparable to that of the National Security Council with respect to the integration of the foreign and military policies of the U.S."³⁰⁸ Like the NSC as well, it would function as a statutory, policy-making body vested with administrative responsibility and held accountable to Congress, through the

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President. To support its functions, the Senate authorized the board to employ an executive director and other specialized staff.

The structure and functions of the Policy Board reflect the Senate's conviction that no single agency could be assigned total responsibility for the space field. They also reveal the Senate's determination that the military interest in space would not be abridged. While the board had a civilian majority in membership, the military departments would be included at this highest echelon of space policy-making. In addition, the Secretary of Defense—but not the administrator of NASA—was authorized to appeal separately to the President in any case where action or inaction by the board seemed to threaten his space mission.

On June 16 the Senate unanimously passed H.R. 12575 as amended by the entire text of S. 3609. The sole important amendment on the floor was offered by Senator Johnson, striking out the patent provisions pending review by the conference committee. With its passage, the alignments in the final struggle to pass a space act were drawn. The Senate had taken a stand on the division of functions between the DOD and NASA which aligned it with the administration (in its latest position) and against the House. But so far as the mechanisms providing for national space-policy-making were concerned it placed itself in opposition to both the administration and the House.

After the Senate passed its bill, neither body seemed disposed to compromise. The House considered its bill close to the original administration proposal. The Senate held the position that its bill alone recognized the characteristics of urgency and breadth necessary for a successful space program.

Preliminary attempts to resolve differences at the staff level failed. For several weeks the only contacts between the committees were those between Mrs. Eilene Galloway of the Legislative Reference Service and special consultant to the Senate committee, and Gerald Siegal, chief of staff of the Senate committee on the one hand, and Dr. Charles Sheldon, of the Legislative Reference Service and associate staff director of the House committee, and Glenn Wilson of the House staff, on the other.³⁰⁹ The House staff tried subsequently to extend contacts without success. They believed that Johnson was striving to increase his bargaining position by holding out for the Senate bill or none at all.

At this impasse, the White House reentered the arena. The stimulus seemed to come from Senator Johnson. One Sunday late in June or early July, the Majority Leader called on the President.³¹⁰ During this interview the President—reputedly for reasons not directly related to the space program—agreed to a modified version of the Policy Board.

Senate

When Killian returned after the weekend, the President informed him of his wishes. With administration concurrence, and with a record of support for administration space policies, McCormack was now persuaded to reconsider the House position. In this atmosphere and with two major outstanding issues settled—the wording of Section 2 and the interagency coordination mechanisms—negotiations for a conference committee meeting reopened. The issues at hand were the formulation of congressional committees; provisions for international cooperation; and patent procedures. Both houses agreed that the agency could engage in international cooperative ventures under the foreign-policy guidance of the President.³¹¹ The Senate abandoned its demand for a joint committee and accepted two standing committees. The House accepted the Senate patent provisions.* These staff negotiations completed, the Conference Committee met for one session on July 15 with Johnson in the chair. The agreements were ratified and the conference accepted the bill.†

In addition to these compromise proposals reached in conference, the final bill contained those agreements made by the two houses with the administration. Section 2 finally read: "[aeronautics and space activities] shall be the responsibility of and shall be directed by a civilian agency exercising control over aeronautics and space activities sponsored by the U.S. except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the U.S. [including the Research and Development necessary to make effective provision for the defense of the U.S.] shall be the responsibility of and shall be directed by the DOD."³¹² This wording represents a victory for the Senate, although incorporating the clarifying language about research and development written by the House.

Section 204 provided for a Civilian-Military Liaison Committee composed of representatives from the DOD, the services, and NASA. This organ would permit the agencies to consult and in-

*These granted title to NASA except under certain specified conditions in which the administrator could waive title to the contractor. The provisions were written in the O'Mahoney Subcommittee on Monopoly of the Senate Judiciary Committee. During June some patent attorneys and their clients had argued in favor of the original administration assumption that NASA patent procedures would follow the DOD's, vesting patent rights in the contractor in exchange for free use of the patented invention by the government. Resisting such pressures, the Senate wrote in restrictive provisions.

†The conference bill was principally drafted by the House staff. The House Committee on Science and Astronautics was established on July 21 in House Resolve 580 on the basis of H. R. Report # 1837, "Amending the Rules of the House to provide for a Committee on Science and Astronautics." The Senate amended its rules to create a Committee on Aeronautical and Space Sciences in Senate Resolve # 327 on the basis of Senate Report # 1925.

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form each other on matters within their respective jurisdictions. Its structure departed slightly from the original House proposal, since it was no longer placed in the DOD; however, it was designed to provide the project-level coordination which the House had deemed necessary for effective collaboration in space.

What had been the National Aeronautics and Space Board in the administration proposal, the Aeronautics and Space Advisory Committee in the House bill, and the National Aeronautics and Space Policy Board in the Senate bill, finally became the National Aeronautics and Space Council. This nine-member advisory organ was to be composed of the President as chairman, the Secretaries of State and Defense, the Administrator of NASA, the Chairman of the AEC, one other representative of the federal government, and not more than three private citizens appointed by the President. It was authorized to employ a staff and was to advise the President on all activities authorized by the act. Specifically, the council would survey all aeronautical and space activities of all government agencies engaged in such programs and develop “a comprehensive program of aeronautics and space activities to be conducted by the agencies of the U.S. Government.”³¹³

The bill passed both Houses on the day of the conference, and Eisenhower signed it into law as the National Aeronautics and Space Act of 1958 on July 29.³¹⁴ “In the long view of history,” Johnson proclaimed a month later, “possibly the most important step we took during this session was to establish an agency to guide America’s effort in the exploration of outer space.”³¹⁵

Conclusion

The passage of the National Aeronautics and Space Act of 1958 was generally viewed by informed observers as a “victory” for the scientific community. From one perspective this interpretation seems plausible. NACA, one of the oldest scientific enterprises within the federal government, had been preserved and reinvigorated. The military had not assumed primary responsibility over the total space mission. Spokesmen for science had participated directly in the drafting of the administration’s legislation and had indeed shaped some of its key concepts. Scientists outside and within the government had generally united in their preferences for an independent civilian-based space agency, emphasizing the exploration of outer space as a pursuit of knowledge as well as a strengthening of the nation’s security.

Yet a moment’s reflection on the events and actions incident to the act sharply modifies this plausible interpretation. For one thing, the interests of the scientists were shared by other powerful actors

in the process. A separate civilian agency and a clear orientation toward the peacetime uses of a space program served the political and budgetary purposes of the administration very well. They also reflected the convictions of "generalist administrators" ably represented by the Bureau of the Budget.

Two other points should be noted. First, where the organizational and management viewpoints of the scientists appeared to threaten the interests of the military, they did not prevail. The military mission remained protected in large measure to the degree satisfactory to the office of the Secretary of Defense and the Air Force. Most important of all, the Congress of the United States, led by Lyndon Johnson, succeeded in broadening the conception of the space program and identifying it as a major national program far beyond the expectations and even the desires of the scientists and their allies within the office of the President. Johnson's concept of a Space Council that institutionalized the high priority he placed on the program, his equal emphasis upon military and civilian aspects, and the sense of urgency which the entire Congress attached to the total undertaking triumphed over the administration. In a fundamental way it was a broadly conceived and dramatic program which emerged in response to the political impact of Sputnik, not a carefully designed, reasoned policy for the support of space science per se.

The influence of these other components of the political process can lead a thoughtful observer to doubt not only that science "did it alone" but also to question whether science as a political force could ever do it alone. Prior to Sputnik I, the scientific backing and participation in the original Vanguard program had not been sufficient to generate political support. After Sputnik II the values the scientific community espoused were clearly joined with other values before the conflict was resolved and the space mission defined.

Two conclusions would seem to follow. First, the public management of the space enterprise after 1958 involved the pursuit of policy objectives which go far beyond the benefits for science and national security to be derived from space exploration. A successful administration of the program requires, so the history of the legislation suggests, the simultaneous pursuit of a number of objectives, some clearly nonscientific in character. Second, if the scientists and their spokesmen were to continue to achieve a substantial number of their aims they would have to proceed in concert with their allies and in conflict with their adversaries. The enactment of the law signaled a tentative and discernible deployment of forces. For men concerned with the overall scientific strength of the nation, the quality of research and development, and the training and recruitment of new scientific talent, the establishment of NASA in 1958 was the beginning of political activity, not the end.

NOTES

- 1 U.S. House of Representatives Select Committee on Aeronautics and Space, *Hearings on the testimony of J. Edgar Hoover, A. J. Hayward, A. J. Naval Operations & Development*.
- 2 U.S. Senate Committee on Aeronautics and Space, *Investigating the Committee on Services, H. into Satellite Programs*, p. 1. General Johnson's command, Army Air Force, Air Force, these Senate Subcommittee on Aeronautics and Space, be referred to the Senate.
- 3 See U. S. House of Representatives, #124, "Special National Act for the Corporation," 2nd Session International "The IGY," 1959; and *the Unknown* Graw Hill.
- 4 See U. S. House of Representatives, Select Committee on Aeronautics and Space, *Hearings on the testimony of John T. I. Chief of Naval Research* (Hereinafter *Hearings*), p. 275 ff, testimony of John T. I. Chief of Naval Research (Hereinafter *Hearings*), p. 275 ff. See also *Aeronautics* (Washington: Government Printing Office, 1961), pp. 5-6.
- 5 U.S. House of Representatives, Committee on Aeronautics and Space, *Hearings on the testimony of John T. I. Chief of Naval Research* (Hereinafter *Hearings*), p. 275 ff.

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- 1 U.S. House of Representatives, Select Committee on Astronautics and Space Exploration, *Hearings on H.R. 11881*, p. 275, testimony of Admiral John T. Hayward, Assistant Chief of Naval Operations for Research & Development.
- 2 U.S. Senate, Preparedness Investigating Subcommittee of the Committee on Armed Services, *Hearings, Inquiry into Satellites and Missile Programs*, p. 1699, testimony of General John B. Medaris, Commander, Army Ballistics Missile Agency. (Hereinafter, these Senate Preparedness Subcommittee Hearings will be referred to as SPSCH.)
- 3 See U. S. Senate. Document #124, "Special Report by the National Academy of Sciences for the Committee on Appropriations," 84th Congress, 2nd Session; Walter Sullivan, *International Conciliation*, "The IGY," #521, January, 1959; and Sullivan, *Assault on the Unknown* (New York, McGraw Hill, 1961), *op. cit.*, p. 28.
- 4 See U. S. House of Representatives, Select Committee on Astronautics and Space Exploration. *Hearings on H. R. 11881*, p. 275 ff, testimony of Admiral John T. Hayward, Assistant Chief of Naval Operations for Research and Development. (Hereinafter, these House Hearings will be cited as HH.) See also Eugene M. Emme, *Aeronautics and Astronautics* (Washington, D.C., U.S. Government Printing Office, 1961), pp. 59, 61.
- 5 U.S. House of Representatives, Committee on Appropriations, Subcommittee on Department of Defense Appropriations. *Project Vanguard: A Scientific Earth Satellite Program for the International Geophysical Year* (A Report... by the Surveys and Investigations Staff), Hearings, Part VI, 86th Congress, 1st session, pp. 56-57.
- 6 Erik Bergaust and William Beller, *Satellite!* (Garden City, N.Y., Hanover House, 1956), p. 36.
- 7 See U.S. House of Representatives. *Project Vanguard...*, *op. cit.*, p. 57; HH., pp. 155, 48-49 (testimony of Chief Scientist of ARPA, Herbert York); see also Sullivan, *Assault on the Unknown*, *op. cit.*, p. 80.
- 8 U.S. House of Representatives, *Project Vanguard...*, *op. cit.*, pp. 57-58. See also Sullivan, *Assault on the Unknown*, *op. cit.*, chap. 6.
- 9 HH., p. 63, testimony of Dr. Werner von Braun.
- 10 U.S. House of Representatives, *Project Vanguard...*, *op. cit.*, p. 58.
- 11 HH., p. 63, testimony of Dr. Werner von Braun. See also U.S. House of Representatives, *Project Vanguard...*, *op. cit.*, pp. 58-59.
- 12 U.S. House of Representatives, *Project Vanguard...*, *op. cit.*, p. 59.
- 13 U.S. Senate, Preparedness Investigating Subcommittee of the Committee on Armed Services, *Hearings, Inquiry into Satellites and Missile Programs*, p. 148, ff. (Hereinafter, these Senate Preparedness Subcommittee Hearings will be referred to as SPSCH.)
- 14 See SPSCH, pp. 209, testimony

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194 S. 3233, introduced by Sens. Yarborough, Mansfield, Hill, Sparkman, Carroll, Morse, and Humphrey, and referred to the Interstate and Foreign Commerce Committee. H.R. 9847 and H.R. 9966, introduced by Reps. Thomas Lane and Melwin Coad, respectively, and referred to the House

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 258 See SH, p. 198, testimony of Assistant Secretary of the Air Force Malcolm MacIntyre.
 259 See SH, p. 197, testimony of Assistant Secretary MacIntyre; see also, HH, p. 672, testimony of Gen. Schriever; see also, HH, p. 527, testimony of Gen. Boushey.
 260 HH, p. 145, testimony of Gen. Medaris.
 261 See HH, p. 146, testimony of Gen. Medaris.
 262 See HH, p. 690.
 263 See SH, p. 221.
 264 Reps. Leslie Arends and Overton Brooks, neither of whom participated actively in the hearings on the space bill.
 265 See HH, pp. 75-76.
 266 See Griffith, op. cit., Chap. 6.
 267 See HH, p. 1121, and HH, p. 1158, comments of Mr. George Feldman, Staff Director and Chief Counsel to the House Committee.
 268 HH, p. 893, statement of Rep. John McCormack, Chairman, House Select Committee on Astronautics and Space Exploration.
 269 See HH, p. 415.
 270 HH, p. 470.
 271 See HH, p. 427; see also HH, p. 435.
 272 HH, p. 862, remarks of Rep. McCormack.
 273 HH, p. 676, remarks of Rep. Lee Metcalf.
 274 See HH, pp. 462 ff.
 275 HH, p. 136.
 276 See SH, pp. 6-7, statement of Sen. Johnson.
 277 See SH, pp. 297, ff.
 278 See SH, p. 30, remarks of Sen. Leverett Saltonstall.
 279 SH, p. 24, remarks of Sen. Bourke Hickenlooper.
 280 NYT, May 10, 1958.
 281 See SH, pp. 229, ff.; see also, SH, p. 73.
 282 See SH, p. 85.
 283 See SH, p. 219.
 284 SH, p. 55, remarks of Sen. Stuart Symington.
 285 See SH, p. 58, statement of Mr. Edwin Weisl, Consulting Counsel to the Senate Committee.
 286 See SH, p. 37; see also SH, p. 276, comments of Mr. Weisl.
 287 HH, p. 1165, testimony of Director Roy Johnson.
 288 See HH, p. 1168, testimony of Director Johnson.
 289 *Ibid.*
 290 See HH, p. 1191, testimony of Director Johnson.

- 291 *SH*, p. 150, testimony of Director Johnson.
- 292 *SH*, p. 169, testimony of Director Johnson.
- 293 *NYT*, May 9, 1958.
- 294 See Coward, *op. cit.*, pp. 7-12.
- 295 See *SH*, p. 17, testimony of Dr. Doolittle, where he suggests that the President appoint a committee consisting of Killian, Quarles, the director of NASA, Strauss, and Waterman to "resolve questions as to which specific items should be in NASA and which should be in the DOD and which should be joint projects."
- 296 *HH*, p. 1528, testimony of Mr. Robert Dechert, General Counsel of the DOD (statement cleared with Gerald Morgan, Assistant Counsel to the President.)
- 297 *Ibid.*
- 298 *HH*, pp. 1534-1540, *passim*.
- 299 *SH*, p. 236.
- 300 U.S. House of Representatives, Select Committee on Astronautics and Space Exploration, *Establishment of the National Space Program, Report on H.R. 12575* (Report No. 1770, 85th Cong. 2nd Sess., 1958).
- 301 See Griffith, *op. cit.*, p. 79.
- 302 See *ibid.*, Chap. 8; see also, *NYT*, June 3, 1958.
- 303 See *NYT*, June 3, 1958.
- 304 See Griffith, *op. cit.*, Chap. 8. The bill itself was largely written by Gerald Siegal, Chief of Staff for the Senate Committee, in Johnson's office. It was accepted in one meeting of the Senate Committee, practically as drafted.
- 305 U.S. Senate, Special Committee on Space and Astronautics, *National Aeronautics and Space Act of 1958* (Report No. 1701, 85th Cong. 2nd Sess., 1958).
- 306 *Ibid.*, p. 4.
- 307 *Ibid.*
- 308 *Ibid.*, p. 7.
- 309 Private interview.
- 310 Private interview, see also Killian, *op. cit.*
- 311 U.S. House of Representatives, Committee of Conference, National Aeronautics and Space Act of 1958 (Report No. 2166, 85th Cong. 2nd Sess., 1958), Sec. 205.
- 312 *Ibid.*, Title I, Sec. 102(b).
- 313 *Ibid.*, Title II, Sec. 201.
- 314 *PL* 85-568.
- 315 Congressional Record (daily edition), Aug. 23, 1958, p. 17884.

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